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DEPARTMENT OF THE INTERIOR
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GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 342

SURFACE WATER SUPPLY OF THE YUKON-TANANA REGION, ALASKA

BY
C. E. ELLSWORTH
AND
R. W. DAVENPORT

WASHINGTON
GOVERNMENT PRINTING OFFICE
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Oklahoma City, Okla

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PREFACE.

By Alfred H. Brooks.

The following report presents the results of six years of observations on water supply of the Yukon-Tanana region. Unfortunately the records are very unequally distributed, both geographically and as to length of observations. Records of run-off have been obtained for six years at Fairbanks, for five years in the Birch Creek district, for three years in the Fortymile district, and for shorter periods in other districts. Moreover, although this report throws light on the water supply of the entire Yukon-Tanana region, yet large areas in this region have not been visited by the engineers who have carried on this investigation. It is believed, however, that the data presented make it possible to estimate the run-off of streams which have not been gaged and will serve as a valuable guide to the hydraulic engineer who is seeking a supply of water. It need hardly be added that such use of the report will not take the place of the careful measurement of water supply that must precede any extensive installations. Such use, however, should make this report of great value to the placer-mining industry of the region.

Mr. Ellsworth and his associates deserve great credit for the results here achieved. Much of the work was carried on under great difficulties because of the unsettled condition of the region. The engineers have for the most part worked alone. Their investigations outside of the established mining camps have involved journeys which have put their physical endurance to severe tests and have involved considerable hardship.

In view of the demands for surveys in other parts of Alaska it is necessary for the present to discontinue stream gaging in the Yukon-Tanana region. For this reason this summary report has been prepared in the hope that it will meet the more pressing demands for information about the water supply. It is hoped that before long money will be available to resume the work in some parts, at least, of the Yukon-Tanana region, for it is believed that at least 10 years' observations should be obtained in every district where extensive use of water supply is likely to be made.

SURFACE WATER SUPPLY OF THE YUKON-TANANA REGION, ALASKA, 1907 TO 1912.

By C. E. Ellsworth and R. W. Davenport.

INTRODUCTION.

SCOPE OF INVESTIGATION.

A study of the surface water supply of the Yukon-Tanana region was begun in 1907 and was continued each season till the end of that of 1912. The essential part of the information thus obtained has been made available for general distribution as soon as practicable after the close of each field season through the medium of the annual report on the mineral resources of Alaska. A detailed report of the work of 1907 and 1908 was also published as Water-Supply Paper 228. Now that water-supply studies are to be discontinued indefinitely in this region it is desirable that all the data accumulated shall be brought together in one volume, with such additions and revisions as seem proper in the light of more complete knowledge.

The points at which gaging stations have been maintained were determined largely by the location at which gage observers were available. Many streams on which records of daily discharge were highly desirable were so isolated as to be beyond reach with the small allotments available. Further, many stations could not be located at the most desirable points for obtaining accurate results or even with reference to the places at which information was most likely to be requested. The duration of the records (one year to six years) is insufficient to show the extreme limits of flow that should be expected. Notwithstanding all this, however, it is believed that the records, if used with proper care and with due allowance for accuracy, duration, and location, will satisfy most of the needs of miners. It should be emphasized that before any extensive development is undertaken on any stream these records should be supplemented by a more detailed study of the particular water supply.

DIVISION OF WORK AND ACKNOWLEDGMENTS.

The hydrometric surveys, the results of which are published in this report, were carried on under the appropriation for the investigation of the mineral resources of Alaska by engineers detailed for this purpose from the water-resources branch of the United States Geological Survey. The work has been under the general supervision of Alfred H. Brooks, geologist in charge of Alaskan work.

The first work of this nature to be undertaken in the Yukon-Tanana region was begun in the Fairbanks district in June, 1907, by C. C. Covert, who established a few regular gaging stations and made a general reconnaissance of that district until September 23 of that year.

During the season of 1908 work was continued by C. C. Covert and C. E. Ellsworth. In March, 1908, Mr. Covert went to the Fairbanks district to gather data on the spring run-off from the melting snow, and later in the season he extended the work to the Rampart and Hot Springs districts. In June Mr. Ellsworth and Mr. Covert met at Circle and made a reconnaissance trip across country to Fairbanks and established a few regular gaging stations in the Birch Creek basin. On August 1 Mr. Ellsworth went to the Rampart and Hot Springs districts, where he continued the work until September 22. Mr. Covert and the rest of the party remained in the Fairbanks district until the end of August, when they started back to Circle, arriving there September 15. Much credit for the amount of data obtained and the extended territory which the party was able to cover is due to George Neuner, jr., field assistant, who made many of the measurements, and to C. E. Anderson, who acted as cook and packer.

The work of 1909 was carried on by Mr. Ellsworth from April 1 to September 12. As many of the old stations as possible were continued and a few new ones were established. Two trips were made up Tanana River as far as McCarty's, in addition to the work in the Fairbanks, Rampart, Hot Springs, and Circle districts.

On April 1, 1910, Mr. Ellsworth and G. L. Parker arrived at Fairbanks and commenced field work in that district. Early in June, after having commenced the investigation in the Fairbanks and Circle districts, Mr. Ellsworth proceeded to Eagle and studied the water supply in the Fortymile, Eagle, and Seventymile districts until the later part of September. Mr. Parker continued work in the Fairbanks, Circle, and Salchaket districts for the remainder of the season. In view of the needs and possibilities of the several districts, the slow means of transportation, and the scanty funds available, it was decided to discontinue the work in the Rampart and Hot Springs districts.

In 1911 the work was carried on by Mr. Ellsworth and E. A. Porter, who arrived at Eagle in the middle of April and spent most of the time until May 27 in installing a gage and determining the flow of Yukon River, in establishing several minor stations, and in making general plans for the season. Mr. Ellsworth then went to Circle and continued the field work until August 22. Mr. Porter continued field work in the Fortymile, Eagle, and Seventymile districts until about the middle of September.

The investigations of 1912 covered about the same areas as in 1911. Mr. Ellsworth and R. W. Davenport arrived at Eagle May 19 and commenced field work which ended about the middle of September. Mr. Ellsworth continued the investigations in the Fairbanks and Circle districts, and Mr. Davenport took up similar work in the Fortymile, Eagle, and Seventymile areas.

J. C. Hoyt, engineer in charge of surface water supply investigations, has given valuable advice regarding general plans for field work and the preparation of reports.

For gage readings and assistance in making discharge measurements in the Little Chena River basin special credit is due to Sherman White in 1907 and 1908 and to T. J. Shaw in 1910.

It would be almost impossible to give individual credit to all who assisted in the work. The most hospitable treatment and kindly aid have been extended at all times by residents of this region to members of the Survey. Individual credit for assistance in obtaining gage readings and discharge measurements is given in connection with the published data.

Particular acknowledgment is due to the following persons who through cooperation or definite assistance contributed directly toward the prosecution of the work: Mr. John Zug, superintendent of the Alaska Road Commission; Mr. C. W. McConaughy, chief engineer of the Chatanika Ditch Co.; Mr. Falcon Joslin, president of the Tanana Valley Railroad Co.; Mr. Herman Wobber, Fairbanks Creek; Mr. Martin Harris, Chena Lumber & Light Co., Chena; Mr. W. H. Parsons, general manager of the Washington-Alaska Bank; Mr. F. G. Manley, Baker Hot Springs; Mr. A. V. Thorns, superintendent of the Manley mines, Baker Hot Springs; Mr. M. E. Koonce, Rampart; employees of the Northern Commercial Co. and the Mammoth Creek Mining Co., Circle; and Louis Greul, Fairbanks.

PUBLICATIONS.

The geology, topography, mining industry, and general features of the area have been discussed at length by geologists and others detailed from the United States Geological Survey. The following is a partial list of the reports that have been published. Those marked with an asterisk (*) are out of stock at the Survey but can be purchased from the superintendent of documents at the prices stated.

Reports of an expedition to the Copper, Tanana, and Koyukuk rivers in the Territory of Alaska, by H. T. Allen, 1887, 172 pp.[1]

*Geology of the Yukon gold district, Alaska, by J. E. Spurr. Eighteenth Annual Report, pt. 3, 1898, pp. 87–392. $2.15.

A reconnaissance in the White and Tanana river basins, Alaska, by A. H. Brooks. Twentieth Annual Report, pt. 7, 1900, pp. 425–494.

The Mount McKinley region, Alaska, by A. H. Brooks, with descriptions of the igneous rocks and of the Bonnifield and Kantishna regions, by L. M. Prindle. Professional Paper 70, 1911.

*The geography and geology of Alaska, a summary of existing knowledge, by A. H. Brooks, with a section on climate by Cleveland Abbe, jr., and a topographic map and a description thereof by R. U. Goode. Professional Paper 45, 1906, 327 pp. $1.

*Methods and costs of gravel and placer mining in Alaska, by C. W. Purington. Bulletin 263, 1905, 362 pp. 35 cents.

*Geographic dictionary of Alaska, by Marcus Baker; second edition, prepared by James McCormick. Bulletin 299, 1906, 690 pp. 50 cents.

Railway routes in Alaska. 62d Cong., 3d sess., H. Doc. No. 1346.[1]

*The coal resources of the Yukon, Alaska, by A. J. Collier. Bulletin 218, 1903, 71 pp. 15 cents.

*The gold placers of the Fortymile, Birch Creek, and Fairbanks regions, by L. M. Prindle. Bulletin 251, 1905, 89 pp. 35 cents.

Yukon placer fields, by L. M. Prindle. Bulletin 284, 1906, pp. 109–131.

Reconnaissance from Circle to Fort Hamlin, by R. W. Stone. Bulletin 284, 1906, pp. 128–131.

The Yukon-Tanana region, Alaska; description of the Circle quadrangle, by L. M. Prindle. Bulletin 295, 1906, 27 pp.

The Bonnifield and Kantishna regions, by L. M. Prindle. Bulletin 314, 1907, pp. 205–226.

*The Circle precinct, by A. H. Brooks. Bulletin 314, 1907, pp. 187–204. 30 cents.

*The Yukon-Tanana region, Alaska; description of the Fairbanks and Rampart quadrangles, by L. M. Prindle, F. L. Hess, and C. C. Covert. Bulletin 337, 1908, 102 pp. 25 cents.

*Occurrence of gold in the Yukon-Tanana region, by L. M. Prindle. Bulletin 345, 1908, pp. 179–186. 45 cents.

*The Fortymile gold-placer district, by L. M. Prindle. Bulletin 345, 1908, pp. 187–197. 45 cents.

*The Fairbanks gold-placer region, by L. M. Prindle and F. J. Katz. Bulletin 379, 1909, pp. 181–200. 50 cents.

*Water supply of the Yukon-Tanana region, 1907–8, by C. C. Covert and C. E. Ellsworth. Bulletin 379, 1909, pp. 201–228. 50 cents.

*Gold placers of the Ruby Creek district, by A. G. Maddren. Bulletin 379, 1909, pp. 229–233. 50 cents.

*Placers of the Gold Hill district, by A. G. Maddren. Bulletin 379, 1909, pp. 234–237. 50 cents.

*Gold placers of the Innoko district, by A. G. Maddren. Bulletin 379, 1909, pp. 238–266. 50 cents.

The Innoko gold-placer district, Alaska, with accounts of the central Kuskokwim Valley and the Ruby Creek and Gold Hill placers, by A. G. Maddren. Bulletin 410, 1910, 87 pp.

[1] Not a publication of the U. S. Geol. Survey.

Sketch of the geology of the northeastern part of the Fairbanks quadrangle, by L. M. Prindle. Bulletin 442, 1910, pp. 203–209.

The auriferous quartz veins of the Fairbanks district, by L. M. Prindle. Bulletin 442, 1910, pp. 210–229.

Placer mining in the Yukon-Tanana region, by C. E. Ellsworth. Bulletin 442, 1910, pp. 230–245.

Occurrence of wolframite and cassiterite in the gold placers of Deadwood Creek, Birch Creek district, by B. L. Johnson. Bulletin 442, 1910, pp. 246–250.

Water supply of the Yukon-Tanana region, 1909, by C. E. Ellsworth. Bulletin 442, 1910, pp. 251–283.

The Koyukuk-Chandalar gold region, by A. G. Maddren. Bulletin 442, 1910, pp. 284–315.

Placer mining in the Yukon-Tanana region, by C. E. Ellsworth and G. L. Parker. Bulletin 480, 1911, p. 172.

Water supply of the Yukon-Tanana region, 1910, by C. E. Ellsworth and G. L. Parker. Bulletin 480, 1911, p. 217.

Mineral resources of the Bonnifield region, by S. R. Capps. Bulletin 480, 1911, p. 235.

Gold placer mining developments in the Innoko-Iditarod region, by A. G. Maddren. Bulletin 480, 1911, p. 270.

The Bonnifield region, Alaska, by S. R. Capps; including geologic and topographic reconnaissance maps. Bulletin 501, 1912, 162 pp.

*Placer mining in the Fortymile and Seventymile river districts, by E. A. Porter. Bulletin 520, 1912, pp. 211–218. 50 cents.

*Water supply of the Fortymile, Seventymile, and Eagle districts, by E. A. Porter. Bulletin 520, 1912, pp. 219–239. 50 cents.

*Placer mining in the Fairbanks and Circle districts, by C. E. Ellsworth. Bulletin 520, 1912, pp. 240–245. 50 cents.

*Water supply of the Fairbanks, Salchaket, and Circle districts, by C. E. Ellsworth. Bulletin 520, 1912, pp. 246–270. 50 cents.

*The Rampart and Hot Springs regions, by H. M. Eakin. Bulletin 520, 1912, pp. 271–286. 50 cents.

*The Ruby placer district, by A. G. Maddren. Bulletin 520, 1912, pp. 287–296. 50 cents.

*Gold placers between Woodchopper and Fourth of July creeks, upper Yukon River, Alaska, by L. M. Prindle and J. B. Mertie, jr. Bulletin 520, 1912, pp. 201–210. 50 cents.

A geologic reconnaissance of the Fairbanks quadrangle, Alaska, by L. M. Prindle, with a detailed description of the Fairbanks district by L. M. Prindle and F. J. Katz and an account of lode mining near Fairbanks by P. S. Smith. Bulletin 525, 1913, 220 pp.

The Koyukuk-Chandalar region, Alaska, by A. G. Maddren. Bulletin 532, 1913, 119 pp.

A geologic reconnaissance of a part of the Rampart quadrangle, Alaska, by H. M. Eakin. Bulletin 535, 1913, 38 pp.

A geologic reconnaissance of the Circle quadrangle, Alaska, by L. M. Prindle. Bulletin 538, 1913, 82 pp.

The Yukon-Tanana region south of latitude 66° (except a small triangular area north of the Fortymile quadrangle), embracing an area of over 40,000 square miles, has been entirely covered by topographic surveys on a scale of 1:250,000 (approximately 4 miles to the inch) with 200-foot contour intervals. (See fig. 1.) The Fortymile quadrangle was surveyed in 1898 and the remaining areas during 1903 to 1910. An area of about 500 square miles, covering the most important part of the Fairbanks mining district, was topographically surveyed on a scale of 1:62,500 with 25-foot contour intervals in 1907. The following is a list of published maps covering this and adjacent areas:

Fortymile quadrangle; No. 640; scale, 1:250,000; by E. C. Barnard. Price 10 cents a copy or $6 a hundred.

Fairbanks quadrangle; No. 642; scale, 1:250,000; by T. G. Gerdine, D. C. Witherspoon, and R. B. Oliver. Price 50 cents a copy.

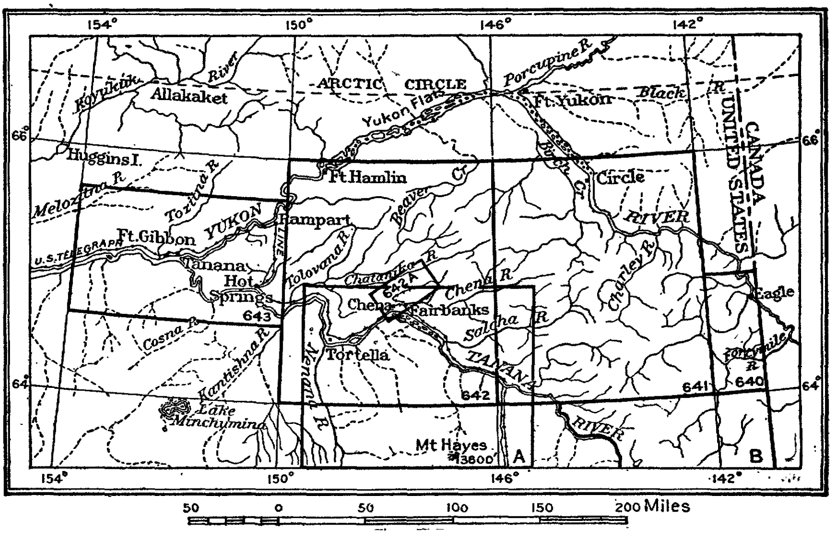


FIGURE 1.—Index map showing location of quadrangles in Yukon-Tanana region.

Rampart quadrangle; No. 643; scale, 1:250,000; by D. C. Witherspoon and R. B. Oliver. Price 20 cents a copy or $12 a hundred.

Fairbanks district; No. 642A; scale, 1:62,500; by T. G. Gerdine and R. H. Sargent. Price 20 cents a copy or $12 a hundred.

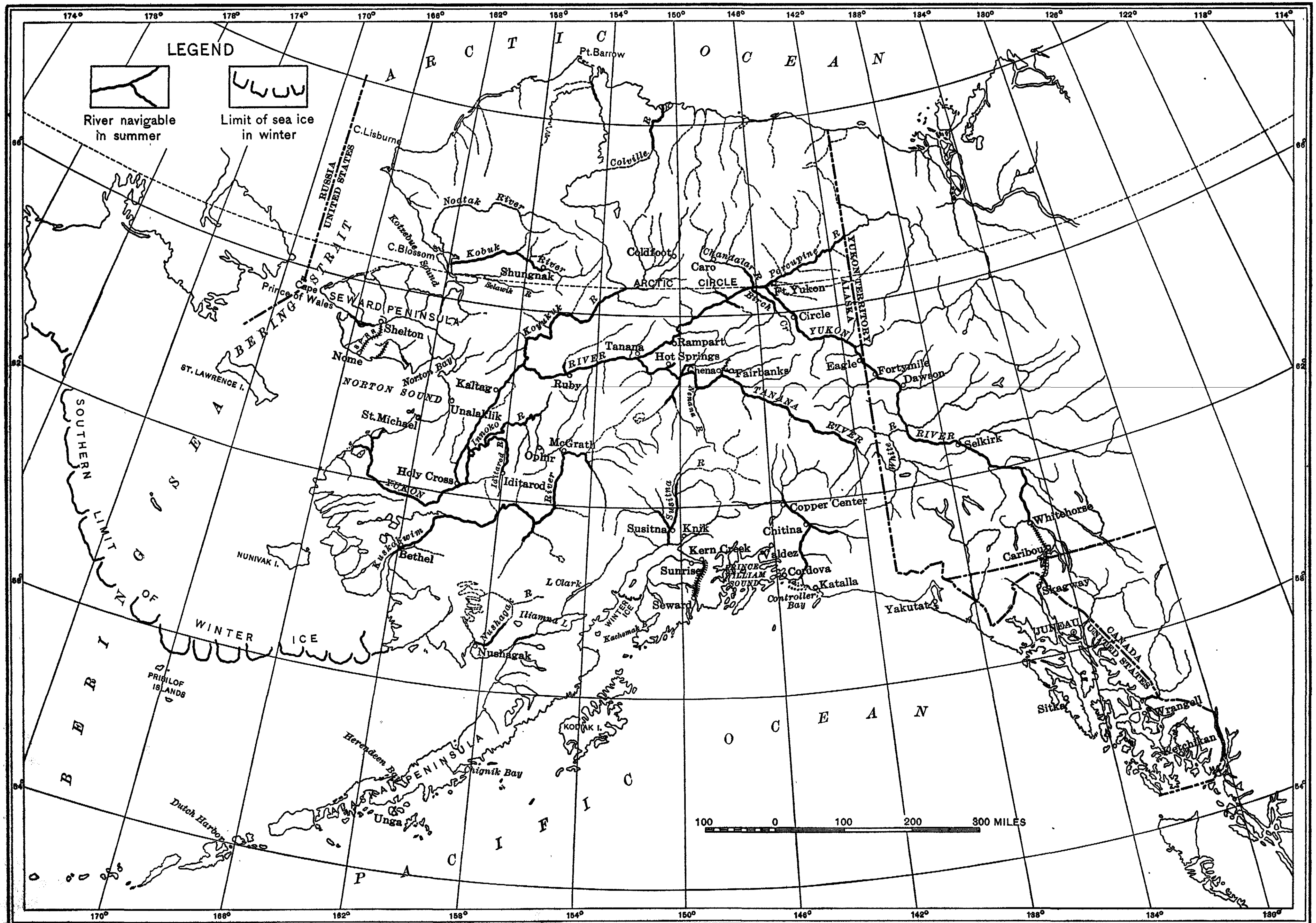
Yukon-Tanana region, reconnaissance map of; scale, 1:625,000; by T. G. Gerdine. Contained in Bulletin 251, 1905. Not published separately.

Fairbanks and Birch Creek districts, reconnaissance maps of; scale, 1:250,000; by T. G. Gerdine. Contained in Bulletin 251, 1905. Not published separately.

Circle quadrangle, Yukon-Tanana region; No. 641; scale, 1:250,000; by D. C. Witherspoon. Contained in Bulletin 295. Price 50 cents a copy.

Upper Tanana River and Ladue Creek region; scale, 1:250,000; by D. C. Witherspoon and J. W. Bagley. In preparation.

The Bonnifield region; scale, 1:250,000; by J. W. Bagley, D. C. Witherspoon, and C. E. Giffin. Contained in Bulletin 501; not published separately.



MAP OF ALASKA SHOWING LOCATION OF YUKON-TANANA REGION.

GENERAL FEATURES OF YUKON-TANANA REGION.

GEOGRAPHY.[1]

The Yukon-Tanana region comprises the part of east-central Alaska bounded by Yukon and Tanana rivers and the international boundary between Canada and Alaska. (See Pl. I.) It covers an area of over 40,000 square miles with a maximum north and south extent of about 175 miles. The distance from the boundary to the junction of the two rivers is nearly 300 miles.

The Yukon-Tanana region forms part of the central plateau province of Alaska. It is an upland which may be termed a dissected plateau, diversified by many broad valleys and their smaller tributaries and characterized by broad flat interstream areas, above which rise numerous rounded domes and some good-sized mountain masses. The surface of the upland maintains remarkable uniformity of altitude throughout considerable areas; it stands at an altitude of 3,000 to 3,500 feet in the eastern part of the region, gradually falls off westward to the vicinity of Fairbanks, where it is only about 2,000 feet in altitude, and rises again to 3,000 feet near the Yukon at Rampart. In many parts of the region flat-topped spurs stand below the general level.

The domes, which rise above the general level, are irregularly distributed and attain altitudes of 4,000 to 5,000 feet. Some mountains with well-defined crest lines also stand 4,000 to 5,000 feet above sea level; among them are the Glacier Mountains, in the Fortymile region, 5,000 to 6,000 feet high; the Crazy Mountains, near Circle, 3,000 to 3,600 feet high; the White Mountains, in the Beaver Creek drainage basin, 3,000 to 4,000 feet high; and the Sawtooth Mountains, near Rampart, nearly 5,000 feet high. The domes are almost entirely composed of stocks of igneous rock and owe their present prominence to the resistance to weathering of these rocks. Some of the mountains are made up of igneous rocks and some of closely folded sediments, but in both types the relief is due to the greater resistance to erosion of their constituent rocks.

GEOLOGY.[2]

Two dominant structural trends of Alaska, one southeast and northwest and the other northeast and southwest, intersect the Yukon-Tanana region and give to the province an important structural position. Numerous individual formations also possess complicated structures. The field has been one of sedimentation, diastrophism, widespread metamorphism, abundant intrusion, and volcanic action. Its position, furthermore, in the basin of the

[1] Prindle, L. M., Katz, F. J., and Smith, P. S., A geological reconnaissance of the Fairbanks quadrangle, etc.: U. S. Geol. Survey Bull. 525, pp. 17-18, 1913.

[2] Idem, pp. 30-32.

Yukon, one of the great drainage systems of the world, has subjected it to long-continued and intricate fluviatile modeling. As it lies outside the widely glaciated region, its topography is due almost exclusively to subaerial denudation. Finally, its bedrock is mantled with unconsolidated deposits, which, though but the product of an episode of geologic history, are nevertheless of great importance with reference to the distribution of placer gold.

The rocks include essentially two great groups, one of metamorphic completely folded schists of pre-Ordovician age, and another, unconformable in its relation to the schists, made up of folded argillites, quartzite, conglomerate, sandstone, altered volcanic rocks, and limestone ranging in age from Ordovician to Carboniferous. Besides these two groups some areas of Lower Cretaceous quartzites and slates and of Eocene friable sandstones, shales, and lignitic coal are found. Igneous rocks are represented in this field by many large areas of granites and by dikes of varied composition. The unconsolidated materials of the province are primarily the alluvial deposits of the valleys and the terrace deposits of gravel, sand, and silt which are developed along Yukon and Tanana rivers.

The mineral resources of the region consist of placer gold, found in the Fairbanks, Birch Creek, Fortymile, Hot Springs, and other districts, and of auriferous and other metalliferous lodes which occur at many places but have been developed only in the Fairbanks district. Most of the developed gold deposits occur in the older schistose rocks and in areas where intrusive rocks are abundant. Gold has, however, been found in other associations. About $75,000,000 worth of gold has been mined in the Yukon-Tanana region. Some silver has been recovered incidental to gold mining, and antimony, silver-ead, and tin ores have been found. Lignitic coal is widely distributed n the region, but no extensive coal fields have been discovered.

CLIMATE.

GENERAL FEATURES.

Abbe,[1] in his very comprehensive discussion of climate in Alaska, divides Alaska into eight climatic provinces, whose pronounced climatic differences he ascribes to mountain ranges, the Japan current, and other physical features. He describes the interior province as comprising the central plateau region between the Rocky Mountain system on the north and the Pacific Mountain system on the south, thus including the Yukon-Tanana region at its very heart. The meager meteorologic records in the interior prior to 1903, summarized by Abbe, have been materially increased since that date, so that more definite conclusions regarding the climate may now be drawn.

[1] Abbe, Cleveland, jr., U. S. Geol. Survey Prof. Paper 45, pp. 133–200, 1906.

TEMPERATURE.

The Yukon-Tanana region is characterized by extreme ranges in temperature, both annual and monthly. The annual range is shown by the records to vary from 120° to 164°. The greatest extreme monthly ranges occur in January and February and frequently exceed 90°. The maximum temperatures reported at the stations range from 85° to 96° and the minimum from −50° to −76°. The maximum, minimum, and mean monthly temperatures at Eagle from 1905 to 1912 and at Fairbanks from 1904 to 1912 are shown in the following tables:

Monthly temperature at Eagle, 1905 to 1912.

Maximum.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1905	......	......	......	......	75	88	91	82	75	63	42	......	......
1906	......	......	51	54	84	92	......	......	......	......	38	34	......
1907	36	20	40	64	82	80	......	......	......	......	......	......	......
1908	......	......	......	......	......	......	......	80	68	50	35	25	......
1909	0	15	44	53	67	82	81	76	67	45	22	......	......
1910	26	28	52	55	78	87	91	78	76	48	30	34	......
1911	10	45	41	59	66	85	......	81	79	61	39	35	......
1912	......	44	51	59	78	80	84	77	67	58	36	36	......
The period	36	45	52	64	84	92	91	82	79	63	42	36	92

Minimum.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1905	......	......	......	......	25	33	40	29	20	− 8	− 8	......	......
1906	......	......	−11	11	23	39	......	......	......	......	−50	−55	......
1907	−53	−52	−42	−32	21	34	31	27	19	−15	−39	−34	......
1908	−48	−31	−50	−20	23	31	32	27	2	−21	−41	−52	......
1909	−69	−51	−27	−20	16	29	33	23	12	− 8	−52	......	......
1910	−61	−63	−50	−17	17	24	29	20	11	− 2	−28	−53	......
1911	−62	−56	−54	−38	20	26	......	24	10	10	−30	−47	......
1912	......	−31	−30	0	16	24	30	20	12	− 2	−40	−50	......
The period	−69	−63	−54	−38	16	24	29	20	2	−21	−52	−55	−69

Mean.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1905	......	......	......	......	47.4	56.8	64.8	60.6	42.6	29.6	14.4	......	......
1906	......	......	28.4	24.6	58.2	67.7	......	......	......	......	......	......	......
1907	− 9.8	−20.0	4.6	30.4	49.8	57.2	......	......	......	......	......	......	......
1908	......	......	......	......	......	......	......	52.3	36.4	18.3	2.9	− 2.1	......
1909	−40.2	−18.4	8.4	19.6	42.2	62.4	59.9	52.1	38.0	20.7	−11.0	......	......
1910	−13.1	−15.8	6.6	23.4	44.4	55.8	59.0	50.6	43.6	26.2	1.2	−19.6	......
1911	−31.3	3.1	5.0	21.2	43.8	55.6	......	51.5	42.2	34.0	.4	− 4.6	......
1912	......	8.8	16.4	32.2	47.7	51.2	54.6	50.6	42.9	28.2	9.0	− 7.4	......
The period	−23.6	− 8.5	11.6	25.2	47.6	58.1	59.6	53.0	41.0	26.5	2.8	− 8.4	23.3

Monthly temperature at Fairbanks, 1904 to 1912.

Maximum.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1904	......	......	......	......	......	......	......	......	62	52	28	23	......
1905	20	......	......	60	72	......	79	82	59	53	40	33	......
1906	13	21	46	58	81	84	83	77	70	58	37	30	......
1907	34	......	35	64	80	79	82	84	63	42	38	20	......
1908	32	38	36	55	74	83	79	80	64	51	46	33	......
1909	25	14	43	54	74	77	82	65	74	49	29	43	......
1910	28	35	44	56	76	86	86	76	78	49	25	32	......
1911	20	43	39	54	59	82	84	85	80	67	35	28	......
1912	29	40	47	60	76	87	85	78	64	53	29	......	......
The period	34	43	47	64	81	87	86	85	80	67	46	43	87

Monthly temperature at Fairbanks, 1904 to 1912—Continued.

Minimum.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1904	.....	.....	.....	.....	.....	.....	.....	.....	17	− 7	−35	−47	.....
1905	−48	.....	.....	0	24	.....	30	29	18	− 8	−25	−47	.....
1906	−65	−38	−22	−12	27	41	40	32	13	2	−50	−46	.....
1907	−58	.....	−48	−31	26	37	38	36	20	−16	−41	−36	.....
1908	−51	−32	−35	−19	30	35	40	31	15	−21	−30	−48	.....
1909	−54	−45	−21	− 8	26	35	42	19	11	−10	−54	−42	.....
1910	−55	−57	−32	−14	24	35	36	30	12	−15	−30	−58	.....
1911	−62	−44	−56	−32	26	31	36	28	22	11	−34	−45	.....
1912	−42	−32	−21	3	26	31	40	31	28	−12	−29	.....	.....
The period	−65	−57	−56	−32	24	31	30	19	11	−21	−54	−58	−65

Mean.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
1904	.....	.....	.....	.....	.....	.....	.....	.....	39.5	28.0	−10.6	−10.8	.....
1905	−17.0	.....	.....	36.6	47.2	.....	52.0	54.8	38.2	23.3	12.6	−13.4	.....
1906	−36.6	0.2	17.7	25.5	49.4	60.4	60.4	55.6	44.0	31.2	.0	−16.7	.....
1907	− 3.3	.....	5.2	30.2	49.8	57.2	59.6	55.4	42.5	19.0	2.6	− 3.5	.....
1908	−11.3	2.7	5.2	26.0	48.6	58.2	59.9	54.3	37.8	21.8	7.0	− .4	.....
1909	−26.2	−10.5	10.2	24.0	47.1	57.2	60.8	44.0	40.0	21.6	− .8	4.6	.....
1910	−19.6	−11.7	8.3	22.3	48.8	57.5	61.2	54.1	45.7	24.2	− 1.0	−12.8	.....
1911	−23.8	2.0	2.5	17.4	42.8	57.2	64.5	46.4	45.4	35.3	− 2.7	− 5.8	.....
1912	− 4.4	9.2	22.7	38.2	51.6	53.9	60.9	55.2	45.6	26.6	1.9	.....	.....
The period	−17.8	1.4	10.3	27.5	48.2	54.7	61.4	52.5	42.1	25.7	1.0	− 7.4	25.2

The long intensely cold winters of the interior have resulted in great depths of permanently frozen ground, some alluvial deposits having been reported to be frozen for more than 300 feet below the surface. Favorable conditions with respect to material and drainage have governed the distribution of frozen ground to some extent, however, and considerable areas are believed to be unfrozen. In the short, comparatively cool summers the depth to which the frozen ground is thawed does not often exceed 3 or 4 feet.

In the winters ice 3 to 6 feet thick usually forms on the larger lakes and streams. Streams like the Yukon, which have an appreciable current, freeze in most places to a depth of 3 to 4 feet. At some rapids, however, as on the Yukon a short distance below Dawson, Yukon Territory, and on other streams, the water never freezes. Quiet bodies of water sometimes freeze to a depth of 6 feet.

On the smaller streams ice formed in the channel frequently obstructs the water underneath and causes it to overflow the surface, where it freezes, thickening the mass greatly. These accumulations of ice, known as glaciers, often form in masses so great that they are not entirely thawed until far into the summer. In many places they seriously obstruct mining, and in others they favor it by prolonging and equalizing the stream flow.

The freeze-up of the navigable streams has such an important economic effect upon commerce in Alaska that it has resulted in the general recognition of two seasons—the "open," during which the Yukon is open to navigation, and the "closed," during which the

Yukon is either filled with floating ice or is frozen over. In the following tables are given records collected by agents of the Northern Commercial Co. on the break-up and freeze-up of Alaskan streams. The dates given show remarkable uniformity as compared with those of streams in more southern latitudes.

In April and early in May the sun gradually becomes higher and its rays warmer until the accumulated snow and ice begin to melt. The tributary streams slowly increase their discharge into the large streams, raising the ice sheet until it can no longer remain intact and breaks away from the shore. This parting of the ice from the shore, or the break-up, indicates that the open season is at hand and is a momentous event for the people of the interior. Once broken up, the ice starts on its way to the sea, attended by an almost unimaginable spectacular display of tremendous forces. From bank to bank the huge moving ice cakes grind upon each other with an awe-inspiring exhibition of resistless force. At places the ice pack is obstructed, but sooner or later it forces its way past the obstacles and moves on, carrying away every movable thing in its path. When, after 7 to 12 days, the river is finally free, the "open season" has commenced and the river boats may venture from their winter quarters. The records show that on the Yukon the break-up usually occurs about May 12 and that navigation may start about May 20.

The date of the freeze-up is not quite so uniform as that of the break-up, but it usually occurs near the last of October or the first of November. The ice commences running in the river, and with the increasing cold the mass grows in size until it solidifies in a complete sheet and becomes anchored to the shore. Thereafter the river is closed to navigation.

Dates of break-up and freeze-up on Yukon River, its tributaries, and St. Michael Bay.

[Furnished by the Northern Commercial Co.]

Stations on Yukon River.

Year.	Dawson.		Eagle.		Circle.	
	Break-up.	Freeze-up.	Break-up.	Freeze-up.	Break-up.	Freeze-up.
1896	May 17	Nov. 13				
1897	May 14	Nov. 8				
1898	May 6	Nov. 5	May 10	Nov. 8		
1899	May 17	Oct. 23	May 16	Nov. 2		
1900	May 8	Nov. 2	May 8	Nov. 13		
1901	May 14	Nov. 12	May 12	Nov. 15	May 22	Oct. 15
1902	May 11	Nov. 4	May 15	Nov. 19	May 16	Nov. 5
1903	May 13	Nov. 9	May 14	Nov. 13	...do....	Oct. 21
1904	May 17	Nov. 6	May 6	Nov. 14	May 17	Nov. 3
1905	May 10	Oct. 10	May 9	Oct. 19	May 16	Oct. 23
1906	May 11	Nov. 7	...do....	Nov. 14	May 14	Nov. 8
1907	May 5	Nov. 2	May 3	Nov. 4	May 8	Oct. 18
1908	May 7	Oct. 26	May 7	Oct. 29	May 13	Oct. 23
1909	May 11	Nov. 11	May 10	Nov. 22	May 12	Oct. 2
1910	...do....	Nov. 4	...do....	Nov. 8	May 15	Oct. 29
1911	May 7	Nov. 8	May 6	Nov. 15	May 12	Nov. 2
1912	May 9	...do....	May 3	Nov. 16	May 15	Oct. 26

Dates of break-up and freeze-up on Yukon River, its tributaries, and St. Michael Bay—Con.

Stations on Yukon River—Continued.

Year.	Rampart.		Fort Gibbon.		Andreafski.	
	Break-up.	Freeze-up.	Break-up.	Freeze-up.	Break-up.	Freeze-up.
1896						
1897						
1898	May 22	Oct. 15				
1899	May 19	Nov. 6				
1900	May 15	Nov. 3	May 8	Oct. 30		
1901	May 24	Nov. 8	May 24	Nov. 3		
1902	May 21	Nov. 9	May 13	Nov. 7		
1903	May 19	Oct. 24	May 22	Oct. 21		
1904	May 11	Nov. 11	May 7	Nov. 4		
1905	May 16	Oct. 29	May 12	Oct. 26		
1906	May 13	Nov. 10	May 16	Nov. 9		
1907	May 10	Nov. 2	May 6	Oct. 27	May 19	Oct. 9
1908	May 14	Oct. 29	May 22	Oct. 26	May 22	Oct. 23
1909	May 17	Nov. 6	..do..	Nov. 3	May 18	Oct. 6
1910	May 18	..do..		Nov. 4	May 28	Oct. 22
1911			May 11	Nov. 8		Nov. 8
1912			May 3	Nov. 4		

Stations on tributary streams of the Yukon.

Year.	Fiftymile River at Whitehorse, Yukon Territory.			Lake Lebarge, Yukon Territory opened.	Tanana River at Fairbanks.		Koyukuk River at Bettles.	
	Break-up.	First boat left for Dawson.	Last boat left for Dawson.		Break-up.	Freeze-up.	Break-up.	Freeze-up.
1899				June 5				
1900		June 8	Oct. 10	May 28				
1901	Apr. 21	June 9	..do..	June 9			May 28	Oct. 7
1902	..do..	May 30	Oct. 17	May 29			May 18	Oct. 22
1903	May 2	June 12	Oct. 11	June 12	May 7	Nov. 13	May 27	Oct. 6
1904	Apr. 25	June 6	..do..	June 6	May 3	Oct. 27	May 13	Oct. 4
1905	Apr. 18	June 1	Oct. 9	May 26	May 8	Oct. 14	May 20	Oct. 6
1906	Apr. 25	..do..	Oct. 11	June 2	May 1		May 12	Oct. 18
1907	May 2	June 5	Oct. 12	June 5	Apr. 30	Oct. 16	..do..	Oct. 7
1908					May 3	Oct. 20	..do..	Oct. 3
1909					May 9	Oct. 10	May 14	Sept. 29
1910		June 8		June 7	May 10		May 21	Oct. 4
1911					May 6	Nov. 4	May 9	Oct. 18
1912							May 12	Oct. 19

St. Michael Bay.

Year.	Break-up.	Freeze-up.	Year.	Break-up.	Freeze-up.
1875	May 25	Nov. 20	1894	June 23	Nov. 1
1876	June 8	Nov. 6	1895	June 18	Dec. 7
1877	June 13	Nov. 15	1896	June 25	Nov. 21
1878	June 15	Nov. 16	1897	June 23	Oct. 25
1879	June 9	Nov. 9	1898	June 13	Oct. 31
1880	June 27	Dec. 6	1899	June 10	Nov. 7
1881	June 11	Dec. 7	1900	June 8	Nov. 22
1882	June 9	Nov. 25	1901	July 3	Nov. 2
1883	June 8	Nov. 21	1902	June 5	Do.
1884	June 10	Oct. 10	1903	June 18	Nov. 1
1885	May 30	Nov. 5	1904	June 20	Do.
1886	June 5	Nov. 13	1905	May 31	Nov. 4
1887	June 14	Nov. 2	1906	June 7	Nov. 9
1888	June 8	Nov. 18	1907	June 6	Oct. 31
1889	June 23	Nov. 16	1908	June 8	Nov. 1
1890	June 6	Nov. 11	1909	June 13	Nov. 4
1891	June 9	Nov. 14	1910	June 16	Nov. 7
1892	June 11	Nov. 7	1911	June 14	Nov. 16
1893	June 10	Nov. 5	1912	June 19	Nov. 7

PRECIPITATION.

Study of the stream-flow and rainfall data of the Yukon-Tanana region shows that they have an exceptionally direct relationship. Therefore, since a large and well-equalized water supply is of very great economic value to the mining industry in this region, the quantity and distribution of the rainfall has great significance, and any study of the run-off of this region would be very incomplete without a careful consideration of the precipitation.

Precipitation stations which have been established for longer or shorter periods in the Yukon-Tanana region, Yukon Territory, and British Columbia are listed on page 24, with their latitudes, longitudes, and approximate elevations. The stations in Alaska have been maintained by or in cooperation with the Weather Bureau, and those in Canada have been maintained by the Canadian meteorologic service. The longest record in the Yukon-Tanana region has been kept at Eagle, where observations are available for 8 complete years and for 65 discontinuous months. Dawson has a continuous record for 11 years and 7 months and Fort Gibbon a very broken record which includes 4 complete years and 91 discontinuous months. The lengths of the different records decrease from those above mentioned to ones extending over but two or three months.

The following tables show the daily precipitation at Eagle and Fairbanks from 1906 to 1912. They also show, for shorter periods, the precipitation at stations which are closer to the mining regions and which it is believed portray conditions in these localities more accurately. In the winter records where snowfall was not reduced to melted snow by the observer, the equivalent rainfall has usually been assumed as one-tenth of the snowfall.

The more complete records show that precipitation occurred on 120 to 140 days in the year and that over half of it fell in the summer. The rains in the region, however, are not excessive, and few of them exceed 1 inch in a 24-hour period; in fact, they are notable for being but slight showers with a mere trace of precipitation. Sometimes these showers occur almost daily and yet are not sufficient to replenish the flow of the steadily falling streams.

During the winter months snow ordinarily accumulates to a depth of about 3 feet. With the advent of the warm days of April and May it melts, usually causing high stages on the streams in the later part of May. On the northern slopes of the mountains, where the snow is protected from the rays of the low-hanging sun, it remains in patches until far into the summer.

The tables give the monthly precipitation, in inches, at all stations maintained in the Yukon-Tanana region from 1903 to 1912. The same data are given for stations in Yukon Territory from 1901 to 1912. The scattered records prior to 1903 have been compiled by Abbe.

On page 39 is given a table summarizing the mean monthly precipitation at stations in the Yukon-Tanana region and Yukon Territory where records have continued over 24 months. The table also shows the length of the record and the mean yearly precipitation for each station. The average mean monthly precipitation at seven Weather Bureau stations in the Yukon-Tanana region and the fluctuation of annual rainfall at some of these stations are shown graphically in figures 3 and 2 (pp. 41 and 40), respectively.

Precipitation stations in Yukon-Tanana region.

Station.	Index letter on Pl. IV.	Latitude.		Longitude.		Approximate elevation above sea level.[a]
		°	′	°	′	*Feet.*
Central	A	65	33	145	49	950
Circle	B	65	50	144	04	500
Charity Creek	C	65	23	146	16	2,800
Chicken Creek	D	64	05	141	56	1,400
Cleary	E	65	05	147	26	1,000
Crooked Creek	F	64	55	141	40	1,000
Discovery Fork	G	64	40	141	19	1,500
Eagle	H	64	45	141	10	850
Eagle Creek	I	65	27	145	28	2,600
Fairbanks	J	64	50	147	44	450
Faith Creek	K	65	17	146	23	1,400
Fort Gibbon	L	65	12	152	00	300
Hot Springs	M	64	58	150	40	350
Kechumstuk	N	64	07	142	20	2,000
Miller House	O	65	32	145	14	1,700
North Fork	P	64	30	142	10	1,400
Poker Creek	Q	65	08	147	28	750
Rampart	R	65	30	150	15	350
Summit House	S	65	02	147	26	2,300
Tanana Crossing	T	63	24	143	24	1,450

[a] The elevations are estimated from the available topographic maps, which are based on a datum determined by barometer. They may therefore be considerably in error but probably show the relative elevations of stations with sufficient accuracy.

Precipitation stations in Yukon Territory and British Columbia.

Station.	Latitude.		Longitude.		Approximate elevation.
	°	′	°	′	*Feet.*
Atlin, British Columbia	59	45	133	46	2,300
Dawson, Yukon Territory	64	05	139	28	1,100
Whitehorse, Yukon Territory	60	46	135	00	2,150

Daily precipitation, in inches, at Eagle, 1906–1912.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.												
1					0.10		0.11	0.03	Tr.			
2					.12				Tr.	0.01		
3			0.49		.02	0.07			Tr.			
4							.04					
5					.03			.04				
6						.03				Tr.		
7												
8									0.01			
9							.07					
10						.09	.11			.78		
11			.34					.02				
12					.02	.12				.02		
13							Tr.	1.10		Tr.		
14		0.14				.01	.08					
15							.16	.02		.40		
16			.36		.03							
17										.20		
18												
19							.16				0.27	
20												
21					.07	.03						
22								.02				
23					.09		.03					
24							.15					
25							.11				.20	
26						.14	.18					
27					.04		.28				.10	0.07
28			1.00		.02		.30					
29							.38			.10		
30						.02	.38			.20		
31					.06							
	0	.14	2.19	0	.54	.51	2.54	1.28	.01	1.71	.57	.07
1907.												
1								.46				
2												.12
3						.28		.20				Tr.
4												Tr.
5						.16			.45			.10
6									.04		.10	
7							.28	.07		.03		
8	Tr.											
9	0.07				Tr.				.05			
10					.08							
11									.12			
12	.77						.23			.25		
13	.61	.10			Tr.	.10			.24			
14		.10			.24					.79		
15						.16		.08	.13			
16							.80					
17				0.25				.11				
18						.48		.05			.30	
19						.04		.06				Tr.
20						.04		.70	.16			
21					.03	.01						Tr.
22						.18			.26			
23								.04				
24						.18						
25												
26						.18		.08				
27							.17	.05				
28						.08				.03		.05
29					.05			.04				
30								.04				
31										.02		
	1.45	.20	0	.25	.40	1.89	1.48	1.98	1.45	1.12	.40	.31

Daily precipitation, in inches, at Eagle, 1906–1912—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.												
1						0.15			0.15			
2												
3									.38			
4	0.05											
5							0.40		.08			
6						.18					0.18	
7												0.29
8						.45			.05			
9												
10												.21
11							.10					.32
12									.45		.20	
13						.16						
14								0.01				
15						.17						
16				0.10				.05				
17									.10	0.09	.16	
18							.90		.05	.06		.19
19			0.75									
20								.75				
21						.40		.15	.10			.08
22												
23							.80			.03		
24									.12			
25	.07				0.10							
26							.05					
27					.30						.20	
28		0.25			.53	.05	.22					
29					.09	.60		.03				
30												
31								.03				
	.12	.25	.75	.10	1.02	2.16	2.47	1.02	1.48	.18	.82	1.09
1909.												
1					.14						.05	
2					.04						.05	
3											.10	Tr.
4						.23				Tr.		.01
5								.12	.08		.05	
6												
7								.24		Tr.		
8												
9								.34				
10				.08		.23			.07			.01
11					.10							
12				.04		.19	.17		.07			
13									.03	.07		
14			.11				.06	.06	.02	Tr.	.05	.01
15						1.00			Tr.	.06	.02	
16				.06					.09	.05	.03	.04
17												
18												
19		.07					.47		.06		.05	
20						.53		.11	.12	Tr.		
21				.08					.21			.09
22				.08		.17			.04			.02
23									.05			
24							.27					
25									Tr.			
26								.08	Tr.			
27							.48		.04			
28	.16						.16					
29												
30							.16					.01
31										.10		.04
	.16	.07	.11	.34	.28	2.35	1.77	.95	.88	.28	.40	.23

Daily precipitation, in inches, at Eagle, 1906–1912—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.												
1						Tr.	Tr.	Tr.	0.13	0.21		Tr.
2							Tr.		.96	.01		
3				0.02		Tr.	Tr.		.04			
4				Tr.		0.24		Tr.	Tr.	.02		0.04
5	Tr.			Tr.		.03	0.45		.05	Tr.		
6	0.01				Tr.	.05				.01		
7	.33			Tr.	Tr.		.04	0.02		Tr.		.04
8	.04					Tr.		1.24				
9			0.04	.01				.33	.10			
10					Tr.	Tr.	.07		.14			.03
11			.01			.01						
12							.78					
13	.04	Tr.	.06	Tr.						.04	0.05	
14		Tr.		.16					.25		.06	Tr.
15				.06	0.08	.05	.07	Tr.	.44			Tr.
16	.01		.20		.07	.13		.44	Tr.		.02	
17	.05					.29	Tr.	.02	.29			Tr.
18	Tr.						.05	.22	.08		Tr.	
19							.13	.04				Tr.
20					.10	Tr.		.03				.10
21	Tr.		.09	Tr.	.03		.15			.25	Tr.	.05
22			.02				.20					
23		0.01	.06			.03	.03	Tr.			.02	.04
24			Tr.	Tr.			.13	.07	.01	.15	Tr.	Tr.
25			Tr.					.14	.33	Tr.		
26			.01				Tr.	.02	.04		.10	
27	.08		.04	Tr.				.06	Tr.			
28	Tr.					.18		Tr.	Tr.	Tr.	Tr.	
29	.27						Tr.			Tr.	Tr.	
30						.04	Tr.		.12		Tr.	
31					Tr.		.18					
	.83	.01	.53	.25	.28	1.05	2.28	2.63	2.98	.69	.25	.30
1911.												
1	.13		.06			.18			Tr.	Tr.		
2	.04											.24
3	Tr.			.30	.06			Tr.			.01	.05
4	.01		.02	.32							.03	Tr.
5	.04		Tr.	.10		.44					Tr.	Tr.
6	.02		Tr.	Tr.		.04				Tr.	.03	
7			.01	.01	Tr.							
8			Tr.	Tr.				.06				
9				Tr.	.17	.06						
10	Tr.		.02	.08		.32		.32	.04			
11			Tr.		.34			.24	.49	Tr.		.05
12			Tr.	.03	.06			.01	.32			.04
13				.06		.19		.14				.05
14			Tr.	.07	.02			.02		.06		
15					.04	Tr.		.30				.07
16				Tr.				.10			Tr.	.06
17			.06					.33		.02	.03	Tr.
18			Tr.		Tr.			Tr.			.04	
19			.07		.65						.02	Tr.
20			Tr.		.07					.05	.01	.11
21					.02							.08
22				Tr.	.06						.02	.01
23			.07						.06		Tr.	.04
24			.02						.10		Tr.	Tr.
25					Tr.				.03		Tr.	
26					.04	.02			.08			
27	Tr.				Tr.			.58	Tr.			
28	.03					.01		.02	.06		.08	
29	Tr.		.06		Tr.				.01		.02	
30			Tr.		.86				.02			
31					.48			.53				
	.27	......	.39	.97	2.87	1.26	......	2.65	1.21	.13	.29	.80

Daily precipitation, in inches, at Eagle, 1906–1912—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.												
1	......	......	......	Tr.	......	0.06	......	0.05	......	0.06	......	......
2	......	......	......	......	......	.44	0.10	......	0.08	......	......	0.11
3	......	......	......	Tr.	Tr.	.05	......	......	Tr.	......	......	Tr.
4	......	......	......	......	......	......	......	.03	.12	Tr.	Tr.	.05
5	......	......	0.01	......	Tr.	Tr.	......	.03	......	.06	......	.04
6	......	......	......	......	0.06	......	......	.13	......	.02	......	.08
7	......	......	......	......	.06	.06	......	.93	.08	......	......	.13
8	......	......	......	......	.04	.06	......	......	......	......	......	......
9	......	0.01	......	Tr.	......	.13	......	......	.14	.30	......	......
10	......	......	......	......	......	......	.14	.21	......	.04	......	......
11	......	......	......	......	.01	......	.44	.92	......	......	......	......
12	......	......	......	......	......	.02	......	.07	.02	.47	......	......
13	......	......	......	......	......	.02	.06	......	......	......	......	......
14	......	.15	......	......	......	Tr.	.17	......	Tr.	.10	......	Tr.
15	......	Tr.	......	......	......	.43	.04	......	......	.04	......	......
16	......	......	......	......	......	.05	......	......	.09	.06	......	.01
17	......	......	......	......	......	......	.13	Tr.	.04	.10	......	Tr.
18	......	......	......	......	......	.14	.04	Tr.	.05	.05	......	......
19	......	......	......	......	......	.04	.02	.06	.07	......	......	......
20	......	......	......	......	......	.30	.35	......	.01	......	......	.11
21	......	......	......	......	......	.01	.65	.03	.02	......	......	.23
22	......	......	......	......	Tr.	.06	......	......	......	Tr.	......	.13
23	......	......	......	......	......	.12	......	......	......	.04	......	.06
24	......	.10	......	......	......	.02	Tr.	......	......	.04	......	.02
25	......	.03	.02	......	......	......	......	......	......	.22	......	.01
26	......	......	.01	......	......	......	.35	......	......	Tr.	0.12	.02
27	......	......	.05	......	Tr.	......	Tr.	Tr.	.04	......	.12	.01
28	......	......	.02	......	.08	......	......	.02	......	......	Tr.	.09
29	......	......	......	......	.18	......	.01	......	......	......	......	......
30	......	......	......	......	......	......	.02	......	Tr.	......	......	Tr.
31	......	......	......	......	Tr.	......	......	......	......	.06	......	......
	......	.29	.11	Tr.	.43	2.09	2.92	2.48	.76	1.66	.24	1.10

Daily precipitation, in inches, at Fairbanks, 1906–1912.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1906.												
1	......	......	......	......	......	......	......	0.04	......	......	......	......
2	......	......	......	Tr.	Tr.	......	0.11	.01	0.03	......	Tr.	......
3	0.30	......	......	0.40	......	......	......	......	......	Tr.	......	......
4	.02	0.02	......	......	0.05	......	.13	......	.04	Tr.	......	......
5	Tr.	......	......	......	.03	......	.05	.22	.01	Tr.	......	......
6	.02	......	......	......	Tr.	......	......	.05	......	Tr.	......	......
7	......	......	......	Tr.	......	0.33	.01	.10	.01	Tr.	......	......
8	.10	......	Tr.	......	......	......	.06	.10	......	......	......	......
9	......	......	......	......	Tr.	......	.06	......	......	0.04	......	......
10	......	......	......	.10	......	......	......	......	......	......	......	......
11	......	......	......	......	......	.10	......	.12	......	......	......	......
12	......	......	......	......	......	......	......	......	......	.02	......	......
13	......	......	......	......	.10	......	......	.02	.02	.01	......	......
14	.10	......	......	......	.15	......	.09	.15	......	.10	......	......
15	.75	......	......	......	......	.42	.47	......	......	.03	......	......
16	.20	......	......	......	......	......	......	.03	......	.09	......	......
17	......	.25	......	......	......	......	......	......	.13	......	......	......
18	......	.02	......	......	.03	......	......	......	.01	......	......	......
19	......	......	......	......	......	......	......	......	......	......	0.15	0.20
20	......	......	......	......	......	......	......	......	......	......	.05	.05
21	.05	......	Tr.	......	......	......	.02	.05	......	......	......	......
22	......	......	......	......	......	.03	.13	.20	......	......	......	.05
23	......	......	......	......	......	......	.01	......	......	......	......	.05
24	......	......	......	......	......	.04	......	.29	......	......	......	......
25	......	......	0.08	......	......	.02	......	......	......	......	......	.05
26	......	......	Tr.	......	......	......	.62	......	......	......	.40	.40
27	.05	.08	Tr.	......	......	......	.15	......	......	......	.05	.10
28	......	......	Tr.	......	......	......	.31	.04	......	......	......	Tr.
29	......	......	Tr.	......	......	......	.43	.02	......	......	......	Tr.
30	.12	......	.05	......	......	......	.04	......	......	.01	......	.20
31	......	......	Tr.	......	......	......	.13	......	......	......	......	.05
	1.71	.37	.13	.50	.36	.94	2.82	1.50	.25	.30	.65	1.15

Daily precipitation, in inches, at Fairbanks, 1906–1912—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.												
1	0.05							0.72		0.02	0.05	
2	.22		0.05					.01				
3	.16						0.04				.02	
4	.35		.04						0.18	Tr.	.03	0.05
5	.35		Tr.			0.15		Tr.	.03	Tr.		.12
6	.04				Tr.	.09	Tr.	.13		.10		
7						.11	.35			.20		Tr.
8	.36					.07	.01	.01	.18	.05		
9	.75		.04		0.15				.02	.09	.25	
10						.15		.25	.05	.23		
11	.20		.17			.05	.02		.23	.50		.10
12			.40			Tr.	.05		.71	.25		.06
13			.17		.06	Tr.	Tr.					.05
14	Tr.		.05			Tr.				.03		
15	.20		.30	0.03		.02	.01	.09	.22			
16	.30					.18	.19		.27			
17	.05					.10	Tr.					
18			.80			.02	.09	.12				
19			.40			Tr.	Tr.			.20		.02
20			.10			Tr.	.14		.15			
21	.02					Tr.		Tr.	.15			
22						Tr.	.01	.05	.16			.02
23	.20							Tr.	.37			.05
24	.05						.25	.18	.01			
25	Tr.		.20				.18	.12				
26							.05	Tr.				
27						Tr.						.12
28						.23				.30		
29					.13	.30		.13	.35	.47		
30					.01		.12		.50			
31												
	3.30		2.42	.03	.35	1.47	1.51	1.81	3.58	2.44	.35	.59
1908.												
1						.18		.11	.21			
2					.02		.16	.20	.09			
3						Tr.	.12	.02	.63			
4			.50				.01		.12			
5			.10	.05		.05			.03			
6							.06		.01		Tr.	
7			.07	Tr.		Tr.	.06		.02	.10		.11
8		0.05		Tr.		.06	.23			.02		.20
9					.09		.01	.02				
10												
11					.02	.18		Tr.		.16		.05
12					Tr.	Tr.			Tr.			
13						.13			.03	Tr.		
14						.02		Tr.				
15						.15		Tr.	.01			
16	.04						Tr.	.02	Tr.			
17								Tr.	Tr.		.46	.04
18	.05					.03	.04	.02	.33	.04	.05	
19	.12		.08				.01	.04	.02			
20			.03					.03				
21			.04		.21	.12		.17				
22					Tr.			.03				.22
23					.02		Tr.			.15		.03
24	.08	.03	.20	.03			Tr.		.03			
25	.02		Tr.	.01			.02					
26	.01		Tr.				Tr.	.02				
27		.10	.08		Tr.			.01				
28		.03			.11	.04	.01	Tr.				
29			Tr.		Tr.		Tr.	.01				
30			Tr.	.02	Tr.							
31												
	.42	.21	1.10	.11	.52	.96	.73	.71	1.53	.47	.51	.65

Daily precipitation, in inches, at Fairbanks, 1906–1912—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1				Tr.						0.20		Tr.
2			0.02		0.12		Tr.		0.06	.10		0.20
3				Tr.			0.03				Tr.	.10
4						0.02						
5				Tr.								
6									.10			
7	0.65				.14		.29		.01			
8	.01				Tr.		.12					
9							.01		.01			
10	.01											
11	.01			0.32		.15	.12				Tr.	Tr.
12	.15			.25	.07	Tr.			.01	.15		
13							.15		.09	.04		
14							.01			.20	0.10	
15						.01	.01				.10	
16				.06							.20	
17												
18									.11		Tr.	
19												
20											.12	
21				Tr.	Tr.	.03			Tr.			.50
22			Tr.						Tr.			
23			.03			.10	.72			Tr.		
24						.93	.13					
25		0.08				.02						
26	.07				.05	.08	.13				Tr.	Tr.
27						.15	.01					
28							.01			.06		
29						.09	.04					
30						.06	.07					
31	Tr.		Tr.				.05					
	.90	.08	.05	.66	.38	1.64	1.90	1.73	.39	.75	.52	.80
1910.												
1									.11			Tr.
2												
3	.05					Tr.						
4				Tr.		.06						
5						Tr.			.38	Tr.		
6					Tr.		Tr.		Tr.			.60
7	.22			Tr.	Tr.							Tr.
8				.35								
9				.01		Tr.						
10						1.45						
11			Tr.			.05				Tr.		
12		.14										
13				Tr.			Tr.			.20		
14	.10								.55		Tr.	
15	.18								.36			
16					Tr.	Tr.		0.20	.12		Tr.	
17						Tr.		.21	.36			
18			Tr.					.75	.03			
19							.11	.10				
20			.01		Tr.		Tr.	.17				
21					.12	Tr.	.15	Tr.			Tr.	
22	.15						Tr.				.45	.16
23		Tr.					Tr.	Tr.		.23	Tr.	
24							.09	.26		.22	Tr.	
25							Tr.			.01		
26			Tr.			.60		Tr.		Tr.	.05	
27				Tr.				Tr.		Tr.		
28								Tr.		Tr.	.08	
29												
30			.01				.11					
31					.27							
	.70	.14	.02	.36	.39	2.16	.46	1.69	1.91	.66	.58	.76

Daily precipitation, in inches, at Fairbanks, 1906–1912—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.												
1	Tr.					Tr.	0.28		0.51			
2	0.40	0.50							.05			0.15
3					1.05			Tr.			0.19	.05
4							.40					
5							.18			Tr.	.20	
6		Tr.										
7							.12	0.15				.63
8						Tr.	.24	.09				
9	Tr.	Tr.	0.06		Tr.				.02			.09
10	.25				Tr.			.75	.10			.10
11							.40	.07	.06			.03
12										0.08		.04
13	.20							.13				.20
14								.61	.10			.02
15								.40				.05
16							.08	.04		.06		
17							Tr.	.01			.10	
18	Tr.				Tr.		.25					
19	Tr.											
20	Tr.											.11
21	Tr.									.08		.06
22	Tr.											.06
23		.12							.23			
24									.12			.03
25									.12			.04
26	.30						.03	.01	.11			.02
27					Tr.		.17	.02	.02			.02
28	.35				.50			Tr.	.09			.13
29					Tr.		Tr.	.02	.07			
30					Tr.		.01	Tr.				
31					Tr.							
	1.50	.62	.06	......	1.55	......	2.16	2.30	1.60	.22	.49	1.23
1912.												
1						0.25			.12			
2	.05					.15			.14			
3			.07			.05		.06	.07			
4								.11	.10	Tr.		
5			.05		.16				.01			
6			.05		.03	.02			Tr.			
7					.06			Tr.				
8					.06							
9		.03			.22					Tr.		
10								.30				
11					.02		.02	.01				
12						.09			.01	.05		
13							.04					
14		.03					.20		Tr.			
15						.13					Tr.	
16			.66			.20	.01	Tr.	.16	.12	Tr.	
17						.03	.19	Tr.	.09	.08	.09	
18						.09	.07	.01	.05			
19	.05					.43	.06		.02	.10		
20							.24	Tr.	.13	.05		
21		.02					.02	.08	Tr.			
22					.03	.17	.01	Tr.		.06		
23					.02	.32		.02				
24			.03			.22		.08				
25						.01	.01	Tr.				
26			.09			.84	.07	.15				
27						.15	.02		Tr.		.15	
28					.50							
29							Tr.		.26			
30							Tr.			.08		
31					.12		Tr.					
	.10	.10	.95	......	1.22	3.15	.96	.82	1.16	.54	.24	......

Daily precipitation, in inches, at Poker Creek, 1907–1909.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1907.						1907.					
1						16	0.01	0.10			
2		Tr.			0.15	17	.01				
3					.30	18	.07				
4		0.10	Tr.	0.08	.20	19			0.13		
5			0.05		Tr.	20		.40			
6	0.05		.30			21	.13	.13			
7	.24	.01	.10			22	.02	.27			0.05
8		.02				23	.13	.15			.05
9	.33	.01	.17	.10		24	.04				
10	.05	Tr.	.30			25	.15				
11		.63	.20	.03	.10	26					
12		.88	.10			27					.04
13					.18	28	.02		.20		
14						29	.15	.30	.15	0.04	
15		70	Tr.			30					
						31					
							1.40	3.70	1.70	.25	1.07

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1908.											
1			0.04	0.02		0.11	0.10	0.40			
2			.03			.40	.12	.32			
3					0.02			.30			
4					.06			.02			
5				Tr.	.33						Tr.
6					.01	.10		Tr.			
7					.12	.16	.04		0.08		
8						.71		.03			0.38
9				.03				.04			
10				.04	.03						
11				Tr.	.13	.04			.08		.04
12				.02	.13	.05			.12		.11
13	Tr.			.08	.06	.05			.06	0.03	
14					.23		Tr.				.04
15							.30			Tr.	
16						.12	.07	Tr.			
17					.47		.07	.16		.28	
18	Tr.				.02	.03	.01	1.00	.32		
19					.05			.05			.02
20	0.06						.08				Tr.
21				.02	.12	.03	.15	Tr.			
22				Tr.				.08			
23				Tr.		Tr.		.05	.09		
24			Tr.			.04					
25			.35			Tr.					
26	.12		Tr.							.04	
27	.80				.02						
28	.34			.10		.18					
29				.18	Tr.						
30				.05							
31				.04							.02
	1.32	......	.42	.58	1.80	2.02	.99	2.45	.75	.35	.61

Daily precipitation, in inches, at Poker Creek, 1907–1909—**Continued.**

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1909.								
1				Tr.			Tr.	0.21
2					0.06		0.18	.20
3				Tr.			.06	
4								Tr.
5								.28
6					Tr.		Tr.	
7	0.20				.15		Tr.	
8					.02	0.04	.24	.24
9							.08	.59
10	.38					.08	.10	.03
11				0.21	.27			.02
12	.10						Tr.	
13							.22	
14								.17
15				.10				
16				.11				
17		0.02						
18		Tr.					.24	.07
19								
20								.05
21				Tr.	.20			
22			Tr.	Tr.	.13			
23			0.03			.63	.75	
24		.02			Tr.			.07
25		.05	Tr.		.20	.04		
26			Tr.		.08	.06	.14	
27						.25		
28								
29						Tr.		
30						.12		
31								.08
	.68	.09	.03	.42	1.11	1.22	2.01	2.01

Daily precipitation, in inches, at Cleary, Faith Creek, and Summit Roadhouse, 1907.

Day.	Cleary.				Faith Creek.		Summit Roadhouse.	
	June.	July.	Aug.	Sept.	July.	Aug.	July.	Aug.
1			1.17			0.49		1.27
2			.12		0.02	.19		.06
3		0.09						
4			.09	0.08		.20		
5				.14	.04	.03		
6			.04			.11	0.30	.27
7		.30	.22	.12	.14	.15	.06	.07
8		.09		.11		.15		.42
9			.46	.22		.10		.11
10		.47	.08		.03	.02	.50	
11		.09			.14		.12	
12		.32		.21			.22	
13				.80	.03	.01		
14					.05		.30	
15		.19		.85	.28	.07	.05	
16		.20			.11	.04	.24	
17		.01			.01		.03	.09
18		.15	.05		.35	.01	.24	
19							.13	
20				.15	.13			
21								.19
22			.10	.52		.13		.04
23			.11	.23				.20
24		.27	.09		.23	.15	.22	.13
25			.13			.36	.15	.03
26		.12			.31	.03	.02	
27	0.01	.07						
28	.41					.09		.26
29	.42	.06	.22			.54	.13	.13
30		.12		.39		.13		
31								
	[a] .84	2.55	2.88	3.82	1.87	3.00	2.71	3.27

[a] June 25–30.

Daily precipitation, in inches, at Charity Creek, 1908.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1		0.01	0.20		0.03	0.37	
2				0.18	.10	.20	
3			Tr.	.02	.01	.44	
4			Tr.			.05	
5			.25	.17			
6			.10	.29		.10	0.08
7			.08	.40	Tr.	.07	
8				.28	.35	.04	Tr.
9		.03					
10		.02	Tr.	.02			
11		.01	Tr.	.31			Tr.
12			.11	.32			.05
13		.05	.01				.05
14			.31	.08	.34		
15			.05		.07		
16			.05	.27	.20	.06	.01
17			Tr.		.20	.08	
18			.04		.20	.38	
19			Tr.	Tr.	.05	.30	.01
20			Tr.		.01		
21			.04		.19		
22				Tr.		Tr.	
23				.10		.18	
24				.02		.01	
25	0.08			.06			
26					Tr.		
27	.03	.02	.03		.28		
28		.13		.25	.15		
29			.06	.03	.15		
30							
31							
	a.11	.27	1.33	2.80	2.33	2.28	.20

a 33 inches of snow on ground at end of April.

Daily precipitation, in inches, at Miller House, 1909, 1910, and 1911.

Day.	1909				1910				1911		
	Sept.	Oct.	Nov.	Dec.	June.	July.	Aug.	Sept.	June.	July.	Aug.
1		0.63									
2			0.10				0.04			0.93	
3			.20								
4										.48	
5						0.59		0.43			
6											
7											
8					0.10						
9					.12	.05					
10					.05						
11											
12	0.20										
13											
14											0.08
15								.60			.10
16				0.30			.02				
17							.04		0.24		
18						1.00	.05		.10		
19											
20	.10					.15					
21	.10				.23	.02					
22		.20			.15						
23						.06					
24											
25							.15				
26					.14						
27											
28					.77				.31		
29	.20				.30	.44			.15		
30					.08						
31		.10				.06					
	.60	.93	.30	.30	1.94	2.37	.30	1.03	1.80	1.41	.18

Daily precipitation, in inches, at Chicken Creek, 1911–12.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.							
1	0.08						
2		0.03					0.05
3		.12	0.15			0.05	
4			.05		0.05	.18	
5		.15			.20	.02	
6	.10	.15			.10		
7							.05
8			.02				
9							
10		.05	.20	0.05			
11				.30			.08
12				.25			.08
13							.10
14		.25	.08		.05		
15			.03				.18
16							
17	.17		.05		.10	.05	
18							
19							
20							.25
21		.08					
22							
23		.07		.05			
24						.05	
25				.10			
26	.05	.10		.05			
27		.08		.17			
28	.05			.05			.10
29						.10	
30							
31			.10				
	.45	1.08	.68	1.02	.50	*a*.45	*a*.89

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1912.									
1	0.08					0.15			
2						.15		0.15	
3	.05								
4						.10			
5									
6					0.20			.40	
7								.01	
8					.25				
9		0.10			.05	.05			0.20
10							0.05	.20	
11								.90	
12									
13						.55	.10		
14		.12				.03	.03		
15						.25			.10
16						.35			
17									.30
18								.02	.10
19									.40
20	.05					.10			
21						.20	.30	.08	
22		.18				.20			
23						.15			
24		.30				.10	.12	.32	
25		.10						.25	
26							.03	.18	
27									
28					.22				
29					.30				
30							.05		.30
31									
	a.18	*a*.80	0	0	1.02	2.38	.68	2.51	1.40

a One-tenth of snowfall.

Daily precipitation, in inches, at Crooked Creek, 1911 and 1912.

Day.	1911			1912					
	July.	Aug.	Sept.	May.	June.	July.	Aug.	Sept.	Oct.
1	0.13				0.04		0.91		0.31
2	.03		0.06		.42	0.35	.12		.03
3		0.04					.05	0.02	
4								.13	
5	.10			0.02					.02
6	.33						.22		.01
7	.04	.13		.14			1.20		
8				.14	.30			.04	
9					.15			.07	.18
10			.20			.25	.12		.38
11		.52			.14	.33	.91		
12			.58				.02	.04	
13	.05	.16			.04	.15		.14	
14	.19	.03				.22			
15		.60			.15			.02	
16		.05						.05	
17		.20			.10	.26	.05		
18		.12				.05	.47	.15	
19		.02				.18	.03	.01	
20								.05	
21	.84				.10	1.30	.20	.03	
22	.05				.03		.03		
23					.03	.75			
24	.09				.20	.05			
25	.03				.10				
26	.44		.38		.35	.33			
27	.10	.02	.05				.40		
28			.03	.03		.02			
29	.10			.60		.02			
30		.19				.11			
31									
	2.52	2.18	1.30	.93	2.25	4.37	4.73	.75	a.93

a Oct. 1-10.

Daily precipitation, in inches, at Discovery Fork, 1911 and 1912.

Day.	1911					1912			
	May.	June.	July.	Aug.	Sept.	May.	June.	July.	Aug.
1		0.10					Tr.		0.23
2							0.37	0.25	
3			Tr.	Tr.					Tr.
4		.05	0.19						Tr.
5		Tr.	Tr.						.06
6						0.07			.40
7		.01					.17		.35
8		.19		Tr.		.10	.16		
9		.26					.04	Tr.	
10			.12	0.70	0.38			.10	.08
11		Tr.			.30		Tr.	.10	.95
12		.17		Tr.	.03		.15	.18	.04
13			.07	.15					Tr.
14			.14	Tr.			Tr.	Tr.	
15				.30			.37	.12	
16				.15				.12	
17				.15				.04	
18	0.08			.10			Tr.	.05	.28
19	.50		Tr.	Tr.			Tr.	Tr.	
20	.03		Tr.					.15	Tr.
21			.47				.22	.43	.05
22	Tr.						Tr.		Tr.
23			Tr.		.23		Tr.		.03
24	Tr.		.57		Tr.		.33		
25					.07				
26			.56		Tr.			.23	
27		.27	.24	.27	.12				Tr.
28		.19			.02	.32		.05	
29	.17					.04	Tr.	Tr.	
30	1.16			.41				.25	
31	.47							.25	
	a 2.41	1.24	2.36	2.23	1.15	.53	1.81	2.32	2.47

a May 17-31.

Monthly precipitation, in inches, at stations in Yukon-Tanana region, 1903–1912.

[Rainfall or melted snow is given in the first line; snowfall in the second line. Melted snow as a rule is taken as one-tenth of the snowfall.]

Station.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Central	1906	0.56	0.06	0.05	0.47	0.86	4.91	4.82	1.85	0.52	0.70	0.80	0.35	15.95
		6.1	1.0	1.4	4.7	2.0					7.0	8.0	4.0	34.2
Do	1907	1.04	.42	2.57	.93	.57	2.21	1.40						
		10.0	4.0	4.0	8.0	1.5								
Circle	1906												.75	
													9.5	
Do	1907	1.02	.57	.28	.15	.29		1.36	2.79	1.73			.63	
		8.5	7.8	3.25									8.2	
Do	1908	1.23	.25	.76	1.45	.29	.20	.87	1.08	2.21	.40	.75	1.11	10.60
		9.2	2.5	6.8	8.0						3.0	8.5	11.2	51.2
Do	1909	.44	.47	.17	.75	.60	2.24	3.25	1.02					
		4.5	5.2	1.0	3.0									
Charity Creek	1908				.11	.27	1.33	2.80	2.33	2.28	.20			
											3.0			
Chicken Creek	1911						.45	1.08	.68	1.02	.50	.45	.89	
Do	1912	.18	.80	0	0	1.02	2.38	.68	2.51	1.40				
Cleary	1907						.84	2.55	2.88	3.82				
Crooked Creek	1911							2.52	2.18	1.30				
Do	1912					.93	2.25	4.37	4.73	.75	[a].93			
Discovery Fork	1911					2.41	1.24	2.36	2.23	1.15				
Do	1912				0	.53	1.81	2.32	2.47					
Eagle [b]	1903	.58	.81	.54	.12	1.38	.57	2.40	.97	2.97				
Do	1905					.33	1.95	1.52	2.72	3.38	2.96	.93	.68	
Do	1906		.14	2.19	.00	.54	.51	2.54	1,28	.01	1.71	.51	.07	
			1.0	11.0							.46	8.5	1.0	
Do	1907	1.45	.20	0	.25	.40	1.89	1.48	1.98	1.45	1.12	.40	.31	10.93
		2.0	2.0	0	.15	.55					13.0	4.0		
Do	1908	.12	.25	.75	.10	1.02	2.16	2.47	1.02	1.48	.18	.82	1.09	11.46
		3.0	2.5	7.5	1.0						6.0	7.0	11.0	38.0
Do	1909	.16	.07	.11	.34	.28	2.35	1.77	.95	.88	.28	.70	.23	7.82
		2.0	1.0	1.0	2.0					6.1	11.7	3.0		
Do	1910	.83	.01	.53	.25	.28	1.05	2.28	2.63	2.98	.69	.25	.30	12.08
Do	1911	.27	.24	.39	.97	2.87	1.26	2.36	2.65	1.21	.13	.29	.80	13.44
Do	1912		.29	.11	Tr.	.43	2.09	2.52	2.48	.76	1.66	.24	1.10	
Eagle Creek	1908								2.99					
Fairbanks	1904											1.10	2.00	
Do	1905	.92	.50	.05	.20				2.63	.86		1.20	.60	
		9.1	5.0	.5	2.0							12.0	5.1	
Do	1906	1.71	.37	.13	.50	.36	.94	2.82	1.50	.25	.30	.65	1.15	10.89
		17.5	3.7	3.3	1.0						.6	6.5	11.5	44.1
Do	1907	3.30	.86	2.42	.03	.35	1.47	1.51	1.81	3.58	2.44	.35	.59	18.71
		33.0	8.6	24.2	.3						24.4	3.5	5.9	99.9
Do	1908	.42	.21	1.10	.11	.52	.96	.73	.71	1.53	.47	.51	.65	7.92
		4.2	2.0	11.0	.8								8.1	26.2
Do	1909	.90	.08	.05	.66	.38	1.64	1.90	1.73	.39	.75	.52	.80	9.80
Do	1910	.70	.14	.02	.36	.39	2.16	.46	1.69	1.91	.66	.58	.76	9.83
Do	1911	1.50	.80	.06		.12		2.16	2.30	1.60	.22	.29	1.23	
Do	1912	.10	.10	.95	0	1.22	3:15	.96	.82	1.16	.54	.24		
Faith Creek	1907							1.87	3.00	2.97				
Fort Gibbon	1903	.37	.73	1.14	.23	.16	.38	1.76		.48	.22	.33	Tr.	
Do	1904	.08	.55	.35	.09	.22	.33	1.95	3.80	.35	.39	.07	.70	8.88
Do	1905	.37	.47	Tr.	.32	.84	1.50	4.90	3.02	.59	.50	1.10	.18	13.79
Do	1906	.65	.20	.30	Tr.	1.00					[b].50	.99	.27	
		6.0	2.0	3.0							[c]5.0	9.9	2.7	
Do	1907	1.26		.53	0	.30		2.58	2.31	2.32	1.22	.03	.31	
		12.6		5.0	0					4.0	12.0	1.5		
Do	1908	.23	.26	.90	0	1.16		.96	1.13	1.60	.45	.08	.60	
		4.0	6.0	17.0	0					2.25	6.0		6.5	
Do	1909	.05	.10	.37	.39	1.51	.77	1.49	2.27	.90	.49	.46	.80	9.60
		.5	.5		2.2						4.8	4.6	8.0	20.6
Do	1910	1.23	.08	.60	.28	.69	.57	1.79	2.26	.74	.38		.59	
Do	1911	.94	1.63	.38	.77	1.53	.27	1.41	2.19	1.53	.44	.16		
Do	1912	.08	.65	1.16	.02	1.18	2.06	1.59	3.24	1.15	.87	.08	.36	12.44
Hot Springs	1909							1.76	3.19	.25	.44	1.10	2.26	
											4.4	11.0	22.6	
Do	1910	1.64	.03	.60	.20	.34	.76	[d]2.16		1.32				
		16.4	.3	6.0	2.0	3.4								
Kechumstuk	1904					1.80	.83	2.23	.94	.64	.30	.03	.23	
Do	1905	.90	.10	.05	.40	.20	1.58	.40	1.48	2.16	1.18	.36	.20	9.01
Do	1906	.36	.05	.06	.27	1.69	1.61	3.25	2.51	.51	.31	.29	.20	11.11
		4.0	.5	1.0	5.0						4.3	.5	3.0	18.3
Do	1907	.12	.20	.27	Tr.	1.30	2.03	1.60	2.14	.49	.72	.40		
		2.0	3.0	4.0		12.0				2.0	9.0	4.0		
Do	1908	0	0	.41	.40	1.78	1.77	2.30	2.22	1.35		.90	.20	
		0	0	5.0	4.0							9.0	2.0	
Do	1909	0	.30	.10	.20	0	3.66	3.39						
		0	.5	1.0		0								

[a] Oct. 1–10. [b] Records at Fort Egbert to June, 1909. [c] Oct. 7–31. [d] July 16–31.

Monthly precipitation, in inches, at stations in Yukon-Tanana region, 1903-1912—Continued.

Station.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Miller House	1909	......	......	......	......	......	......	2.98	1.26	.60	.93	.30	.30	......
		......	......	......	......	......	......	......	......	4.0	8.0	3.0	3.0	......
Do	1910	......	......	......	.20	......	1.94	2.37	.30	1.03	......	......	......	......
Do	1911	......	......	......	......	......	.80	1.41	.18	......	......	......	......	......
North Fork	1905	......	......	......	......	......	......	......	1.91	1.86	......	.50	.20	......
Do	1906	.70	.50	.10	.80	1.98	2.74	2.69	1.01	.72	.42	.55	.38	12.59
		7.0	5.0	1.0	8.0	......	......	......	......	......	3.2	4.5	4.5	33.2
Do	1907	.69	.28	.27	Tr.	1.34	1.92	1.57	3.19	2.0	1.40	.20	......	......
		15.5	3.0	3.0	......	4.0	......	......	......	5.0	12.0	2.0	......	......
Do	1908	.50	......	......	......	......	......	......	......	......	......	......	......	......
		5.0	Tr.	......	......	......	......	......	......	......	......	......	......	......
Poker Creek	1907	......	......	......	......	......	......	......	1.40	3.70	1.70	.25	1.07	......
		......	......	......	......	......	......	......	......	......	24.0	3.3	6.8	......
Do	1908	......	1.32	......	.42	.58	1.80	2.02	.99	2.45	.75	.35	.61	......
		......	10.5	......	5.0	......	......	......	......	4.5	6.9	4.4	12.6	......
Do	1909	.68	.09	.03	.42	1.11	1.22	2.01	2.01	......	......	......	......	......
		8.8	2.0	.5	8.0	2.5	......	......	......	......	......	......	......	......
Rampart	1905	......	......	......	......	......	1.33	1.99	2.19	1.70	1.20	1.43	.33	......
Do	1906	.63	.08	.17	.04	.40	.15	1.86	2.40	.59	.61	.95	.33	8.21
		7.2	2.0	1.8	.5	......	......	......	......	......	......	10.2	3.5	25.2
Do	1907	1.17	.44	1.17	.02	.44	1.64	2.29	3.38	2.52	.65	.55	1.26	15.53
		12.0	4.5	12.8	2.5	......	......	......	......	......	......	6.3	......	......
Do	1908	1.08	.52	.81	.58	.82	1.38	1.13	.46	1.56	.39	.73	1.14	10.60
		11.5	6.9	8.1	......	......	......	......	......	......	5.1	3.6	16.8	52.0
Do	1909	.09	.10	.37	.51	1.04	.85	2.01	1.41	.36	1.14	.35	1.99	10.22
		1.4	1.2	6.2	5.6	......	......	......	......	1.5	14.4	3.6	20.2	54.1
Do	1910	.84	.08	.36	.07	.20	.98	.71	.62	.43	.45	.26	.32	5.32
		11.1	.8	4.7	1.0	......	......	......	......	......	6.0	3.5	5.0	32.1
Do	1911	1.05	2.20	.31	.75	.48	.34	.43	1.12	.79	.57	.21	......	......
Do	1912	.13	.45	.81	.01	.86	3.03	.54	1.52	1.50	1.21	.27	.59	10.92
Summit Road house	1907	......	......	......	......	......	......	2.71	3.27	[a]8.33	......	......	......	......
Tanana Crossing	1904	......	......	......	......	.76	......	.78	.89	1.06	.15	.10	.90	......
Do	1905	.24	.08	.18	.00	.14	......	.37	2.95	......	1.40	.60	......	......
Do	1906	.30	.00	Tr.	......	......	......	......	......	......	......	......	......	......

[a] Sept. 1-22.

Monthly precipitation, in inches, at stations in British Columbia and Yukon Territory, 1901-1912.

Station.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Atlin, British Columbia	1905	......	......	......	......	......	......	......	......	1.06	0.48	1.55	0.76	......
Do	1906	1.37	0.72	Tr.	......	0.25	1.74	1.62	0.71	.78	1.45	2.55	.88	......
Do	1907	.99	2.18	.55	0.09	.34	.32	.42	1.48	.58	.82	2.34	.51	10.62
Do	1908	1.08	.60	1.76	.08	.14	.89	.21	.80	1.96	1.49	1.48	.95	11.44
Do	1909	.33	.53	2.12	.36	.49	.51	1.92	1.82	2.54	1.37	.70	.28	12.97
Do	1910	.68	.88	1.30	.88	1.06	1.28	2.11	1.03	.57	.62	.73	1.17	12.31
Do	1911	.75	1.35	1.17	.10	.16	.74	.41	1.69	1.96	.59	1.12	1.68	11.72
Do	1912	.80	.37	.08	.26	.17	.26	.50	1.77	.51	1.25	.60	1.39	7.96
Dawson, Yukon Territory	1901	......	......	......	......	......	.94	1.32	1.64	1.17	2.25	1.10	1.55	......
Do	1902	1.73	.20	.00	.50	.46	.86	3.32	2.38	1.17	.92	1.10	.80	13.44
Do	1903	.50	1.35	.60	.60	.39	.50	1.11	1.47	2.41	1.25	.45	.65	11.28
Do	1904	.82	.32	.20	.57	.96	1.71	2.14	1.66	1.01	.36	.80	1.45	12.00
Do	1905	.23	1.30	.40	.94	.97	.25	1.93	2.51	3.52	1.84	.24	1.24	15.37
Do	1906	1.26	.51	.22	.42	2.00	.92	1.20	1.46	1.14	.47	1.55	.93	12.08
Do	1907	1.53	.34	.88	.23	1.06	.85	1.93	1.28	2.34	.47	2.60	.62	14.13
Do	1908	.71	1.00	.71	.32	1.43	1.23	2.43	1.08	1.25	.69	1.48	1.96	14.29
Do	1909	.30	.48	1.21	.64	.81	2.66	2.10	.81	2.40	.96	.67	1.17	14.21
Do	1910	1.31	.22	.68	1.68	.19	1.44	.82	1.67	1.34	1.67	1.46	1.60	14.08
Do	1911	1.52	.91	.77	1.30	1.68	.87	1.37	1.39	.86	1.60	1.05	1.70	15.02
Do	1912	.20	1.05	.60	.00	.38	.75	2.48	1.59	.00	.00	1.12	2.09	10.26
Whitehorse, Yukon Territory	1904	......	......	......	......	......	......	......	......	......	......	1.50	.30	......
Do	1905	1.72	.00	.18	.10	.15	.20	3.30	.92	2.10	1.50	1.20	.30	11.67
Do	1906	.55	.75	.00	.23	.65	1.72	1.55	1.39	.55	.30	1.10	.20	8.99
Do	1907	.55	.52	1.45	.08	.27	3.03	5.10	1.63	.86	.26	.90	.30	14.95
Do	1908	......	......	......	......	......	......	......	......	......	......	......	.08	......
Do	1909	.45	.30	.40	2.55	.64	.87	1.98	2.34	.97	.60	.90	.30	12.30
Do	1910	.18	.06	.30	.02	.03	.66	4.67	1.36	.50	.00	.10	.33	8.21
Do	1911	.20	......	......	......	......	......	......	......	......	......	......	......	......

Mean monthly precipitation at stations in Yukon-Tanana region and Yukon Territory.

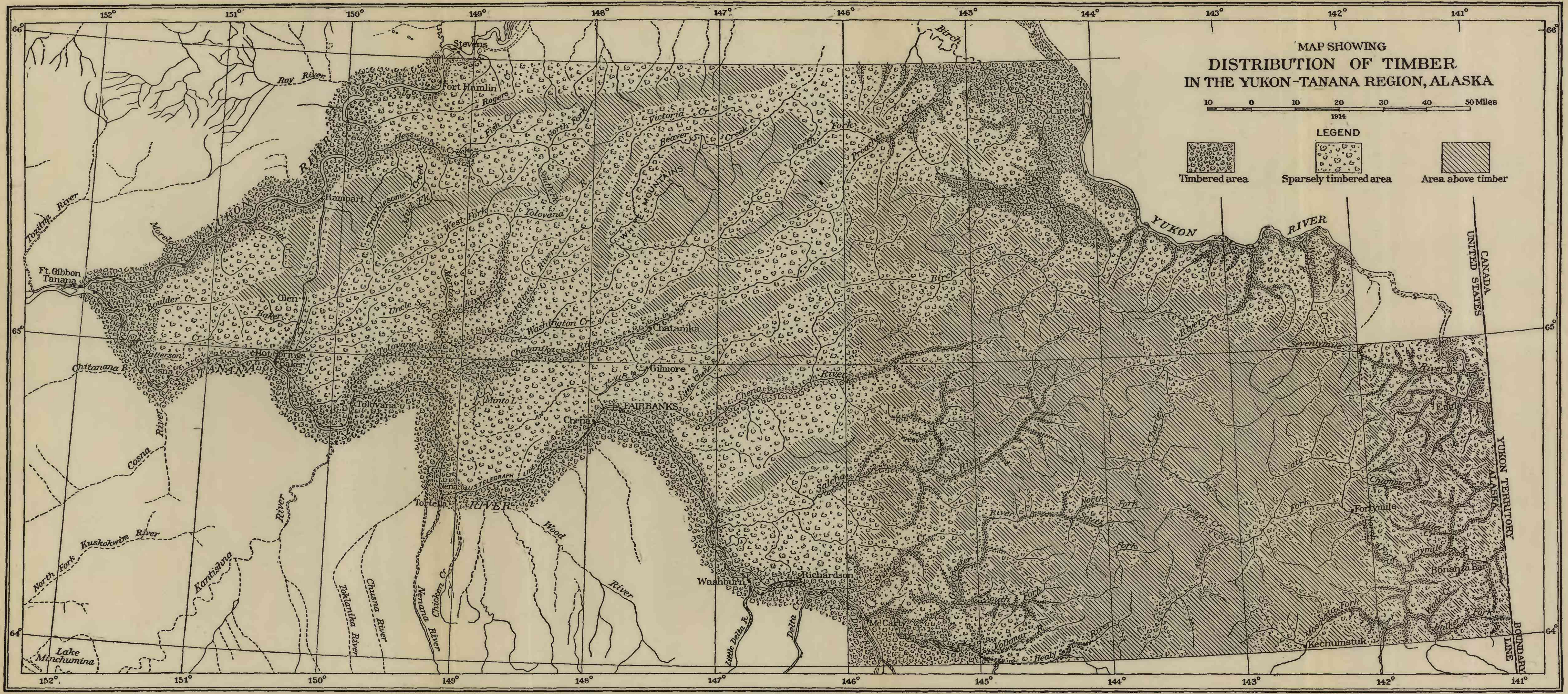
Station.	Length of record.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	Yr. m.													
Circle	1 18	0.90	0.43	0.40	0.78	0.39	1.22	1.83	1.63	1.97	0.40	0.75	0.83	11.53
Eagle	8 65	.51	.38	.51	.49	.89	1.48	2.10	2.28	1.31	1.01	.52	.51	11.99
Fairbanks	5 32	1.20	.38	.62	.18	.48	1.74	1.51	1.65	1.42	.78	.60	.97	11.53
Fort Gibbon	4 91	.79	.59	.56	.21	.92	.84	2.05	2.49	1.17	.78	.58	.59	11.57
Kechumstuk	2 37	.28	.13	.18	.25	1.13	1.91	2.20	1.86	1.03	.63	.40	.21	10.21
North Fork	1 17	.63	.26	.18	.40	1.66	2.33	2.13	2.04	1.53	.91	.42	.29	12.58
Rampart	6 18	.71	.55	.57	.28	.61	1.21	1.62	1.64	1.13	1.77	.59	.73	11.41
Atlin, British Columbia	6 15	.86	.94	1.00	.30	.37	.82	1.03	1.33	1.25	1.01	1.38	.95	11.24
Dawson, Yukon Territory	11 7	.92	.70	.57	.65	.94	1.08	2.01	1.58	1.55	1.04	1.14	1.31	13.49
Whitehorse, Yukon Territory	5 4	.61	.33	.47	.60	.35	1.30	3.32	1.53	1.00	.53	.95	.26	11.25

Precipitation records have not been kept long enough and are not widely enough distributed over the area to justify conclusions in regard to the laws governing the rainfall. However, they indicate certain characteristics and well-defined tendencies which will be briefly noted.

The precipitation during a given period at the different stations, though frequently differing widely in total amount, exhibits to a slight degree the influence of certain general phenomena. The differences in totality are readily explained by a consideration of the way the storms occur, a large portion of the precipitation falling in storms that are very generally distributed but that differ considerably in their intensity. In addition to the rather infrequent general rains there are frequent small showers which are very local in their nature. The monthly or annual rainfall is the summation of these irregular distributions and obviously its amount may vary widely at different stations if the period of the record is not long.

The mean annual rainfall, however, as shown in the longer records, is remarkably uniform from the headwaters of the Yukon, at Atlin, British Columbia, to the mouth of the Tanana, at Fort Gibbon. Hence the physical factors producing the rainfall are probably very similar over this entire area. It seems safe to assume that the mean annual rainfall in the Yukon-Tanana region is approximately 12 inches.

As might be deduced from the foregoing observations, the local variation in annual rainfall is relatively wide. The extreme variation recorded is at Rampart, where a minimum of 5.32 and a maximum of 15.53 have occurred. The record at Dawson, Yukon Territory, is the most uniform, but this is believed to be due simply to chance, for it is unlikely that Dawson differs physically from other stations. The data are insufficient for making a definite estimate of



MAP SHOWING DISTRIBUTION OF TIMBER IN YUKON-TANANA REGION.

the limiting extremes of annual rainfall or for determining any relation between extremely dry and wet periods. (See fig. 2.)

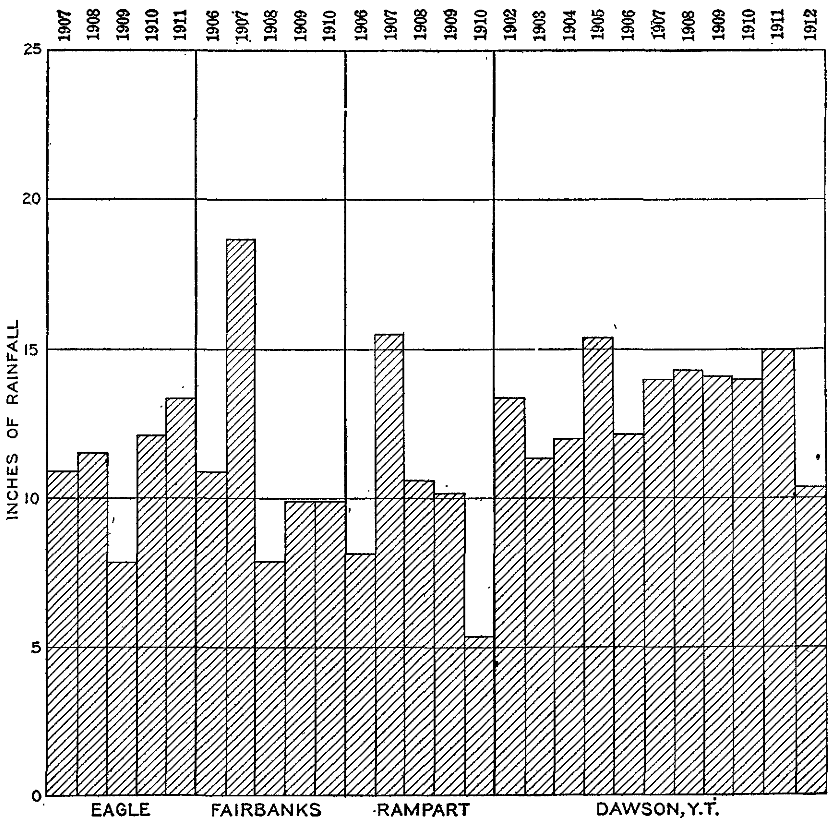


FIGURE 2.—Fluctuation of annual rainfall at Alaska stations.

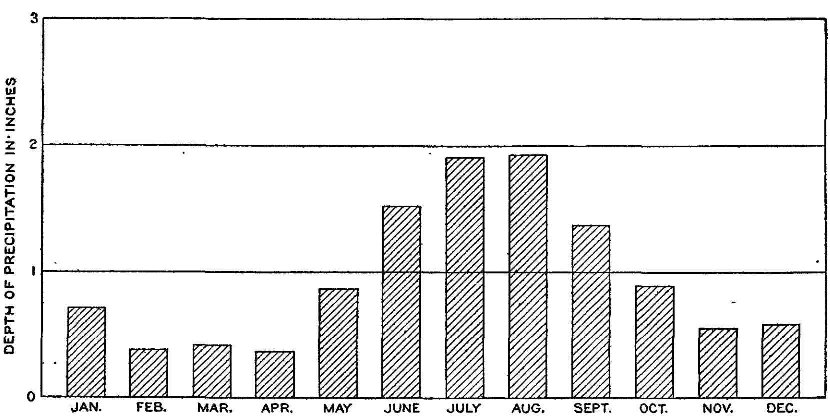


FIGURE 3.—Average mean monthly precipitation at seven Weather Bureau stations in the Yukon-Tanana region.

The distribution of the rainfall throughout the year also varies considerably. A single annual record may show no well-defined tendency in distribution except the greater fall in the summer months. However, a very definite distribution is shown by the monthly means for a number of years, and especially by the average of these means for a number of stations. (See fig. 3.) The composite record shows that July and August have the highest precipitation and that February, March, and April have the lowest. In the four months, June, July, August, and September, about 59 per cent of the annual rainfall occurs. It is interesting to note that the rainfall in the Yukon-Tanana region, both in distribution through the year and in amount, is comparable to that of the semiarid States on the eastern slopes of the Rocky Mountains.

The records are far too inadequate for deductions regarding the effect of elevation on rainfall. During the summer the higher mountains have often been observed to be enveloped by fog and storm clouds to a considerably greater extent than the lower country, and a higher precipitation on them seems probable. The streams heading in the higher mountains appear to have a slightly greater run-off than those with lower drainage basins. It therefore seems very likely that elevation increases rainfall. It is doubtful, however, whether it does so materially.

VEGETATION.

In the Yukon-Tanana region the climatic records show that the mean monthly temperature exceeds 50° for but three months in the year, June, July, and August, and that as a rule the temperature drops to the freezing point in each of these months. Also it has been noted that the ground remains permanently frozen over large areas and during the summers is thawed to shallow depths only. From these facts it is evident that conditions are not generally favorable for a very great plant growth during one season. The most common kind of vegetation is the thick covering of moss, which is found very extensively over all interior Alaska. Underneath this moss there is a thick turf known as tundra, which consists of a wet spongy mass of moss roots and accumulated vegetable matter.

Spruce trees grow very extensively over the area and are of great economic importance both for construction purposes and for fuel. Most of the trees are rather stunted because of the frozen ground, but exceptional specimens measure as much as 3 feet in diameter at the base. Large trees are a pretty good indication that the ground is thawed, thus affording an opportunity for deep root growth. The greater part of the timber of commercial value is found below an elevation of 2,000 feet (see Pl. II), although many small clumps of trees suitable for making the ordinary 12-inch sluice-box lumber are found above that altitude and very many more large enough for fuel grow in favored localities up to 2,500 feet.

Thick stands of spruce timber 6 to 18 inches in diameter occupy a narrow belt along most of the course of the Yukon and Tanana rivers in this region. Some of the larger tributaries of these rivers also have fair growths of commercial-size spruce, which, however, has been considerably depleted on those in reach of the mining districts. Chena River has probably furnished more lumber than any of the other tributaries of the Tanana. Fairbanks received nearly its entire supply of saw logs from that source and each summer thousands of logs are floated down the river and through the Chena Slough to the mills to be sawed for local use.

The Fairbanks district uses annually between 60,000 and 80,000 cords of wood, and the annual product of the three sawmills is probably between 6,000,000 and 8,000,000 board feet.[1]

Birch trees a foot or less in diameter grow in thick clumps over many small areas and are particularly valuable for fuel. Cottonwood groves are frequently seen along the larger streams and adjoining slopes, and many of the trees attain diameters of 6 to 12 inches at the base. Some scattered tamaracks also grow in this area.

One of the determining factors in the mining industry is the timber supply, not only for fuel but for constructing flumes, mine supports, and buildings. So far demands have been fairly met by the local growth, but large inroads on this have now been made by both legitimate uses and by forest fires, and the distance timber has to be transported is gradually increasing with a corresponding increase in cost. Most of the wood sold for fuel probably brings from $10 to $15 per cord delivered at the mines, but some of it may sell as low as $6 or as high as $20 per cord, depending on distance from market, labor conditions, and kind of wood. Rough sawed lumber varies widely in value, ranging perhaps from a minimum of $40 per thousand feet board measure at the Fairbanks mills to as much as $200 per thousand for whipsawed lumber at the more isolated camps.

Most of the higher ridges, except such as are particularly rocky and barren, bear a growth of thick, tough brush, locally known as "buck brush." In some of the gullies and ravines cutting the mountain slopes and in fringes along many of the smaller streams grow almost impenetrable thickets of alders and willows. Beyond this the spruce prevails, being generally largest and best on the bottom lands adjoining the larger streams. Exceptionally, however, the best growth is near the timber line and the trees diminish in size toward the bottom lands, on which thrive the smaller species of vegetable growth.

[1] Railway routes in Alaska: 62d Cong., 3d sess., H. Doc. No. 1346, p. 51, 1913.

From early in June until the frosts occur in August grass suitable for grazing can generally be found on the southern slopes and bottom lands. On areas that have been burned over red-top grass springs up in abundance and grows waist-high in some favored localities. Many berries grow abundantly during the summer; blueberries are found nearly everywhere; small but fine-flavored cranberries can be gathered in many places, and in some localities raspberries and currants are abundant.

Experience has shown that many varieties of vegetables can be profitably grown for local use. In the vicinity of Fairbanks agriculture is extensive, and in nearly every small town and in many outlying districts gardening has proved successful. Oat hay grows luxuriantly in the Tanana Valley and in favored localities along the Yukon, and, if cut green and properly cured, furnishes excellent forage.

TRANSPORTATION.

From Seattle to the Yukon-Tanana region there are three main routes of travel, all of which, compared with the means of transportation in the States, are very slow and expensive, though more comfortable than is popularly supposed. The first, commonly known as the Dawson route, comprises 1,000 miles of ocean travel from Seattle to Skagway by the "inside passage," which is protected from the rough sea by many small islands. From Skagway to White Horse, at the head of navigation on Yukon River, the trip of 110 miles is made by rail over the White Pass, thence down the Yukon by steamboat to Dawson, a distance of 460 miles. Here passengers and freight are ordinarily transferred to American boats for the remainder of the trip to Fortymile, Eagle, Circle, Rampart, Tanana, and other interior points. At Tanana, at the mouth of Tanana River, about 700 miles below Dawson, most of the freight and passengers for Fairbanks, Hot Springs, and other mining centers of the Tanana Valley are transferred to smaller boats that ply Tanana River. Fairbanks, on the Chena Slough, 275 miles above Tanana, can be reached by river steamers, except at low water, when a transfer is made at the mouth of the Chena Slough, 12 miles below Fairbanks, to the Tanana Valley Railroad. At favorable stages of water small steamers navigate as far as the mouth of Delta River, and one steamer reached the mouth of the Nabesna above the Tanana crossing. Without delay at transfer points the trip from Seattle to Fairbanks can be made in about two weeks. A much longer time is taken in returning by the same route because of the slow progress going upriver against the current. This route is open for travel from the early part of June until the later part of September.

The second route from Seattle is 2,700 miles by ocean boat to St. Michael, thence by river steamers over 800 miles up the Yukon to the mouth of the Tanana, then to the several distributing points along those streams. This route is the more favorable for freight because of the somewhat cheaper rates, but it has the disadvantage of a shorter season and of taking three to four weeks for the inward trip. In going out from Fairbanks to Seattle the time required is about the same as going upriver via Dawson and Skagway. Freight rates from Seattle to Fairbanks are from $50 to $150 per ton, with an average of about $75, depending on classification. Passenger rates are about $130 first class and $100 second class.

The third, or overland, route is used mainly in the winter. Ocean boats make frequent and regular trips from Seattle to Cordova or Valdez, a distance of about 1,200 miles, requiring from four to six days. From Cordova the route leads by the Copper River Railroad to Chitina (131 miles from Cordova), then 264 miles by stage to Fairbanks. From Valdez the journey of about 360 miles is made entirely by stage. For passengers and mails this route is used extensively during the winter months, but its cost is so great that only urgent freight can bear the expense.

The Tanana Valley Railroad has 46 miles of narrow-gage track between Fairbanks, Chena, and Chatanika. Wagon roads have been built from Fairbanks to the more important producing creeks. Winter roads have been constructed from Fairbanks to Circle and Hot Springs, and a fairly well defined summer trail leads from Fairbanks to the Miller House in the Birch Creek district. The principal mines adjacent to Rampart and Hot Springs a reconnected with Yukon and Tanana rivers by fair wagon roads.

The Birch Creek mines are reached by a wagon road from the Yukon at Circle to the Miller House, a distance of about 50 miles. Summer and winter trails leading to more isolated diggings connect with the wagon road at various points.

The Fortymile and Seventymile placers are very inaccessible and can only be reached in the summer by poling boats and pack animals. Most of the freight is transported during the winter, when the frozen swamps and rivers furnish solid footing for horses and sleds.

About 16 miles of wagon road, built from Eagle to the summit of the divide at the head of American Creek, has become nearly impassable from lack of maintenance.

Even the mines most favorably connected with roads and river steamers are so handicapped by excessive operating costs that only the richer can be worked at a profit. The proper development of the low-grade placer ground in the Yukon-Tanana region must await the construction of rail and wagon roads and lower transportation charges.

All the principal towns are connected by telegraph both locally and with outside points.

WATER-SUPPLY CONDITIONS AND THEIR ECONOMIC EFFECT.

SEASONAL DISTRIBUTION.

Precipitation in the form of rain or snow is the primary source of all water supply. In the Yukon-Tanana region the chief factor influencing the distribution of this supply is the imperviousness of the frozen ground, which prevents any considerable underground storage and makes the run-off less uniform than it is in warmer climates, where the main source of supply during low-water periods is derived from rainfall and melting snow which has seeped into the ground and has percolated to a final junction with the surface watercourses at a lower elevation. This source, however, is relatively insignificant in this latitude.

The winter accumulations of snow and ice are of great value in drift mining, in which a few weeks of abundant spring flow commonly suffice to wash the gold-bearing gravels hoisted during the entire winter. In the open-cut works, however, where the progress is directly dependent on the water supply from day to day, the spring flow is of little value, for it comes at a time when the ground is ordinarily covered with ice and snow, and work of this nature is impossible. Of course many of the mines lie in the lower valleys, where the ice disappears before the winter accumulations in the upper valleys and hills are exhausted, but even at these the spring floods are generally of such short duration that they are not usually considered a very valuable asset.

An additional supply of water, though one of minor importance, is that derived from the thawing of frozen ground during the summer.

The summer low-water flow of the streams that rise in the higher and more rugged mountains is kept up by the melting of large bodies of ice and snow in the sun-protected gulches and rock crevices. The rainfall, however, is not so well conserved in these streams as in more gently sloping valleys and pondage areas, where the run-off, in percentage of the rainfall, even though less than in higher regions, may be so distributed as to furnish the better supply.

The moss that forms a heavy covering over most of the country probably regulates the distribution of the run-off during the summer as much as any factor. It is quite generally the opinion among the older residents of the country that the flow of the creeks does not hold up as well after a rain now as when work first commenced. That probably is due in part to the fact that the moss covering on the older creeks has been largely removed by fires and other agents. Another reason may be that present-day methods of mining require more water than those practiced in years gone by, and thus the low-water conditions are now more thoroughly realized.

EFFECT OF TOPOGRAPHY.

The topography of the Yukon-Tanana region controls to a great extent the available water supply. The upland area, constituting an old valley floor, has been dissected by numerous streams, all of which necessarily rise at about the same level because of the comparatively uniform elevation of the original land surface. Most of the mines are situated near the heads of the small streams which do not furnish sufficient water to supply their needs. Auxiliary supplies of water can be obtained only from creeks whose sources lie at about the same altitude as the stream whose supply is to be augmented. Therefore a ditch or pipe line must have its intake near the head of the creek, where the drainage basin is small and the supply uncertain. The source of a gravity supply must of course be higher than the place at which it is used; for hydraulic mining, where the water is used under pressure, the source should be several hundred feet above the point of utilization. The streams all have about the same grade and drop rapidly for a short distance near their heads and then take a more moderate grade through their central portions.

Another serious drawback is the lack of natural storage basins above the mines that could with reasonable expense be made to conserve the excess water from rains or melting snow. As a result the water supply available for mining is the daily flow of the stream at the point of diversion. The total run-off during the mining season on many of the smaller streams (from which the supply must necessarily be drawn because of the altitude of the mines) would, if distributed uniformly, be ample for ordinary mining. These streams, however, because of the frozen soil, steep slopes, and lack of natural storage, are very flashy. They rise rapidly after a rain but fall back to a low stage almost as quickly and then very slowly diminish until the next rain.

WINTER SUPPLY.

WINTER GLACIERS.

In the interior of Alaska, where from about the first of November until the first of May the mean monthly temperature is below freezing, the stream flow must necessarily be derived from ground-water sources and must reach the surface in the form of springs. On the smaller streams and on many with catchment areas as great as 300 or 400 square miles the underground supply is insufficient to maintain a free channel. In the autumn and early in the winter the ice gradually freezes deeper and deeper until it extends to the bed of the streams. This forces such part of the run-off as is unable to find its way through the thawed gravels beneath the channel to rise through the ice to the surface, where it spreads out and freezes rapidly, forming large bodies of ice locally known as winter glaciers. Some such "glaciers" reach thicknesses of 15 to 20 feet and extend over large areas, especially in valleys where the gravels are shallow and the underground cross section of the channel is constricted by reefs of bedrock approaching the surface.

RUN-OFF.

On Minook, Hutlinana, and Hoosier creeks an open flow is maintained for some distance during the winter by thermal springs and similar conditions of winter flow are said to occur on other streams in this region. Such springs are probably deep-seated and are not typical of the country as a whole.

In order to gather some idea of the amount of run-off from the Yukon-Tanana region during the winter several discharge measurements were made early in the spring. It is believed that they were all taken before any increased flow from melting snow or ice had reached the streams. They therefore probably represent very closely the minimum surface run-off past the measuring sections for the season from the basin above the point of measurement. The results of these measurements are given in the following table:

Winter discharge measurements in the Yukon-Tanana region, 1909–1911.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
1909.		*Sq. miles.*	*Sec.-ft.*	*Sec.-ft.*
Apr. 20	Hutlinana Creek above Cairo Creek	42.7	[a] 0.4	....
May 1	Yukon River at Rampart	206,000	10,900	0.053
1910.				
Apr. 6	Tanana River, 3 miles below Chena	24,000	4,450	.185
8	Chatanika River below Poker Creek	456	1.91	.0042
17	Salcha River at mouth	2,170	64.5	.030
21	Chatanika River below Faith Creek	132	0.0	.0
1911.				
Apr. 24	Yukon River at Eagle	122,000	10,100	.083

[a] This flow was entirely from hot springs which rise in the creek bed just above the gaging station. Above the springs the creek was frozen solid.

The above table shows clearly that in the winter the surface run-off per square mile from small basins is less than from larger ones. If the measurements are accepted as typical they furthermore show that ordinarily streams draining areas less than 200 or 300 square miles would have no free surface discharge.

SUPPLY AVAILABLE FOR MINING PURPOSES.

Prior to the recent beginning of quartz mining in the Fairbanks district, drift mining was the main industry in that region from about October 1 to May 1. With the exception of two or three outfits on Fairbanks and Ester creeks, that do some sluicing during the winter, work was confined to hoisting the pay gravel to the surface, where it was accumulated in large dumps and was washed early in the summer when the water supply was increased by melting snow and ice.

With the advance of quartz mining the necessity of obtaining a continuous supply of water for washing the crushed rock will confront the mill operators. The smaller streams do not maintain a definite surface-channel flow beneath the ice, and each stream presents a problem peculiar to itself. From 500 to 1,000 gallons of water are required to wash a ton of ore. The average duty of a miner's inch would be about 15 tons of ore per 24 hours, which is about the capacity of the average 5-stamp mill. Unless there is a sufficient flow in the mine that can be pumped to the mill the water in the winter must be obtained by intercepting the flow through the gravels in the stream bottoms. The existence of such flows and the best means of diverting them can be determined only by an intimate knowledge of local conditions. It will probably be found more economical to locate the mill near the water supply and transport the ore downhill than to build the mill at the mine and pump the water to any considerable elevation. On creeks where much prospecting or placer mining has been done a sufficient knowledge of the amount of underground flow in the winter should be available to determine the feasibility of using it for milling.

On Ester Creek, where sluicing was continued throughout the winter of 1910, the ground was thawed, and a small flow of water was encountered in the mine. A 3-inch pump kept the mine drained, and by turning the exhaust into the sump hole warm water was furnished for sluicing. In order to conserve this supply and have a continuous head, the water as it drained from the tailing pile was directed into a settling reservoir, where it was warmed by the exhaust from a pump that raised it again to the sluice. Steam pipes were laid along the sluice boxes, and no serious difficulties were encountered with ice even where the temperature was as low as 60° below zero. Similar methods have been employed on Fairbanks Creek. These examples serve to show what can be accomplished in maintaining a sufficient flow of water for mining from a small source under extremely low temperatures. Small mills of 5 to 10 stamps, such as are likely to be operated in the Fairbanks district, will not require such large quantities of water as are needed for placers.

STREAM FLOW.

TERMS USED.

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 in two groups, (1) those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile; (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is in most general use for all classes of work, and from it the quantity expressed in other terms may be obtained. It is an abbreviation of "cubic foot per second," and may be defined as the unit for the rate of flow of water flowing in a stream 1 foot wide and 1 foot deep at the rate of 1 foot a second. To obtain the actual quantity of water it is necessary to multiply the number of second-feet by the time.

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

The "miner's inch," the unit used in connection with placer mining, also expresses a rate of flow and is applied to water flowing through an orifice of a given size with a given head. The head of the water and the size of the orifice differ in different localities, thus making the miner's inch a most indefinite and unsatisfactory unit. Owing to the confusion arising from its use, it has been defined by law in several States. The California miner's inch is in most common use in the United States and was defined by an act of March 23, 1901, as follows: "The standard miner's inch of water shall be equivalent or equal to 1½ cubic feet of water per minute, measured through any aperture or orifice." This miner's inch corresponds to the so-called "6-inch pressure" and is one-fortieth of a second-foot.

"Sluice head" is a term used commonly among placer miners in expressing the rate of flow through a series of sluice boxes that is necessary to separate the gold from the gravel. It is not a definite term because the rate of flow necessary varies with the size of the sluice boxes, the grade at which they are placed, and the character of the gravel. A sluice head under the varying conditions has been found to vary from 0.75 second-foot to 2.50 second-feet.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of Mar. 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons a second; equals 488.8 gallons a minute; equals 646,317 gallons a day.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot for one day equals 86,400 cubic feet.
1,000,000 United States gallons a day equals 1.55 second-feet.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 43,560 square feet.
1 cubic foot of water weighs 62.5 pounds.
1 horsepower equals 550 foot-pounds a second.
1 horsepower equals 76 kilogram-meters a second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1⅓ horsepower equals about 1 kilowatt.
To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

FIELD METHODS.

On account of the intense cold of the winter season in interior Alaska the stream flow during that period is very small and is consequently of little economic value for mining or power purposes. The data of stream flow given in this paper were collected during the summer and no attempt has been made to estimate the winter flow.

Discharge measurements and gage heights are the basic data from which the daily discharge of a stream may be determined.

Discharge measurements of streams in open channels may be made (1) by measurements of slope and cross section and the use of Chezy's and Kutter's formulas, (2) by means of a weir or dam, and (3) by measurements of the velocity of the current and of the area of the cross section. The method chosen depends on the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—The slope method involves the use of empirical formulas derived by Chezy and Kutter, which make the discharge a function of the slope, the cross section, the wetted perimeter, and a coefficient which depends for its value upon the roughness of the stream bed. It is most commonly used for measuring large streams which have a uniform slope or for estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions. It is in general only roughly approximate and is seldom used by the engineers of the United States Geological Survey. More complete information regarding the method may be obtained from textbooks on hydraulics.

Weir methods.—The weir method makes the discharge dependent upon the head of water flowing over the crest of a weir, the length of crest, and certain coefficients determined by the type of the weir. Standard types of weirs for which accurate coefficients have been determined by experiment give very satisfactory records if properly maintained.[1] The proper installation of weirs in the Alaskan work is usually out of the question on account of expense, the torrential character of the run-off, and the temporary nature of the stations.

Velocity method.—By the velocity method the two factors required to determine the discharge of a stream past a section perpendicular to the mean direction of the current are the mean velocity of flow normal to the section and the area of the cross section. Direct observations of depth and velocity are made at definite points. The distribution of these points across the section is determined by the uniformity and smoothness of flow and the depth and width of the stream. In general they should not be spaced farther apart than 5 per cent of the channel width nor more than the approximate mean depth at the time of measurement.

The measuring points divide the total cross section into strips at each end of which the depth and velocity are known. The discharge through any strip is assumed to equal the product of the average of the depth at the two ends multiplied by the width of the strip multiplied by the average of the mean velocities at the two ends of the strip. The sum of the strip discharges is the total discharge of the stream.

Depths for the determination of the area may be obtained by sounding with a rod or a cable.

The principal methods of measuring the velocity of flow are by floats and current meter.

Floats are not used by the engineers of the United States Geological Survey except under unusual conditions, but as float measurements can readily be made by the prospector the method is described below.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In flood measurements good results can be obtained by observing the velocity of floating cakes of ice or débris. In all surface-float measurements the observed velocity must be

[1] The determination of discharge over the different types of weirs and dams is treated fully in "Weir experiments, coefficients, and formulas" (U. S. Geol. Survey Water-Supply Paper 200), and in textbooks on hydraulics.

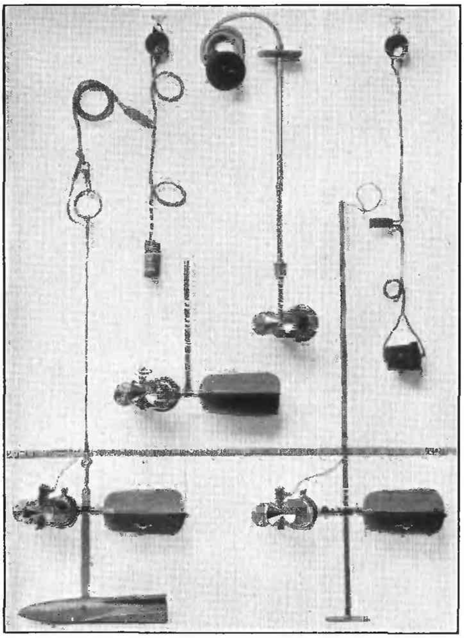
multiplied by 0.85 to 0.95 to reduce it to the mean velocity. The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

If it is desired to estimate roughly the discharge of a small creek or canal, a portion of the channel is selected which is straight and of nearly uniform cross section and through which the water flows smoothly. The length of this stretch, or "run," should be 50 to 200 feet, but in many places it is necessarily less than this because of conditions in the channel. Floats of any simple type may be used. A number of determinations of their time of passage over the "run" are made and the average time in seconds for one passage is computed. The length of the "run" divided by this time and multiplied by 0.85 will give the approximate mean velocity in feet per second through the section. The average depth multiplied by the width of the stream gives the area of its cross section in square feet; this multiplied by the mean velocity will give the approximate discharge in second-feet.

If a more reliable estimate is desired, the location of the floats in the section may be determined, the depth of the stream at these points may be ascertained by sounding or from a developed cross section, and the discharges of the elementary sections may be computed, as already described. In a large stream the coefficient for reducing surface velocity to mean velocity may be determined by taking occasional vertical velocity curves across the section with a current meter. If sufficient care is taken and conditions are good, a float measurement may possess a high degree of accuracy.

The Price current meter is used by the United States Geological Survey almost to the exclusion of meters of other types to determine the velocity of flow of water in open channels. The small Price acoustic and electric meters were the types used in the work in the Yukon-Tanana region. (See Pl. III, *A*.) The meter consists of six cups attached to a vertical shaft which revolves on a conical hardened-steel point when immersed in moving water. The number of revolutions is indicated acoustically or electrically. The relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter by drawing it through still water for a given distance at different speeds and noting the number of revolutions for each run. These data form the basis of a meter rating table which gives the velocity of moving water in feet per second for any number of revolutions in a given period.

Meter measurements of the flow of a stream may be made from a bridge, from a cable and car installed especially for the purpose, from boats, or by wading. The majority of the measurements published in this report were made by wading with the acoustic meter attached to a rod. (See Pl. III, *B*.)



A. SMALL PRICE CURRENT METERS.

B. WADING MEASUREMENT.

Three methods of measuring the velocity were used. In the first the meter is held at the depth of the thread of mean velocity, which has been found by repeated experiments to be located at about 0.6 of the total depth. In the second method the mean of the velocities obtained at 0.2 and 0.8 depth is taken as the mean. This method has been shown to give the mean velocity very accurately, and it is now used very extensively by the United States Geological Survey. In the third method the meter is held near the surface, usually 1 foot below, or low enough to be protected from the wind or other disturbing influence. The coefficient for reducing this velocity to the mean has been found to be from about 0.85 to 0.95, depending on the stage, the velocity, and the conditions of the channel. This method was used principally for boat measurements on large streams or on streams at flood stages.

The determination of the flow of an ice-covered stream is difficult, owing to diversity and instability of conditions during the winter and also to lack of definite information in regard to the laws of flow of water under ice. Very few discharge measurements were made of streams under ice conditions in the Yukon-Tanana region. In these an electric meter suspended by a cable was used, observations of velocity being made at sufficiently short intervals in the vertical to determine the mean.

A prime essential for obtaining accurate stream-flow records is a good gaging station. To make the record, when obtained, most valuable, it should be made at the point on a stream where the record of flow is most likely to be needed either in the present or the future. Other requisites for good stations are (1) a permanent stream bed, (2) freedom from backwater, (3) good measuring conditions, and (4) one channel at all stages. Since gage heights are recorded for the purpose of showing the fluctuations of the stream, they should be observed at frequent intervals, and consequently the station should be located near an available observer. The sparse settlement of the Alaskan placer regions and the transient character of the inhabitants have made proximity of the observer the ruling consideration in the establishment of most stations, in many places to a partial exclusion of the desirable requisites mentioned above. Where practicable, the gage heights were obtained twice a day, but in many places they could be read but once a day, and in some places only once in several days.

OFFICE METHODS.

At the end of each season the field or base data, consisting of gage-height records, discharge measurements, and full notes are assembled. The discharge measurements are plotted on cross-section paper and rating curves are drawn. The rating tables prepared from these curves are then applied to the tables of daily gage heights, and from these the monthly discharge and run-off are computed.

The discharge measurements at a gaging station when plotted with the discharges in second-feet as abscissas and the corresponding gage heights in feet as ordinates, define curves which are generally more or less parabolic in form. Where measurements may be made repeatedly at the same section, curves of area in square feet and of mean velocity in feet per second may also be constructed to the same scale of ordinates as the discharge curve. These curves aid in extending the discharge curve beyond the limits of the plotted discharge measurements, in avoiding errors in the form of the discharge curve, and in determining erroneous measurements. Discharge, area, and mean velocity curves of Fortymile River at Steel Creek are shown in figure 4.

A gaging station on an ordinary open channel without backwater will have one rating curve so long as the relation between gage heights and discharge is not altered. The rating curves are, therefore, directly dependent on the permanency of the channel. Streams in general present throughout their courses to a greater or less degree all conditions of permanent, semipermanent, and shifting channels. These conditions are evident in the plotting of discharge measurements and in the construction of rating curves. Corresponding to the character of the channel a station may have (1) a permanent rating, (2) a rating which is changed only at extreme high water, (3) a rating which is frequently changing and which requires discharge measurements and changes in rating at intervals dependent on the frequency or rate of the change. Although each class of rating is represented in the Yukon-Tanana region, the majority belong to the second class. Most of the smaller streams of interior Alaska have comparatively steep grades and wide fluctuations in stage. At low stages they usually meander through a wide gravel flood plain or through channels cut in the muck. Such channels can not well resist the erosive action of a good-sized freshet and during such may undergo radical changes. In a season with frequent freshets conditions approach those described in the third class. Discharge measurements should then be made frequently, and even with this precaution the daily estimates may be largely approximate.

EXPLANATION OF TABLES AND USE OF DATA.

For each gaging station there is given a table of discharge measurements and a table showing the gage height, the daily discharge, the mean monthly discharge, the mean monthly discharge in second-feet per square mile, the run-off in depth in inches from the drainage area, and the accuracy.

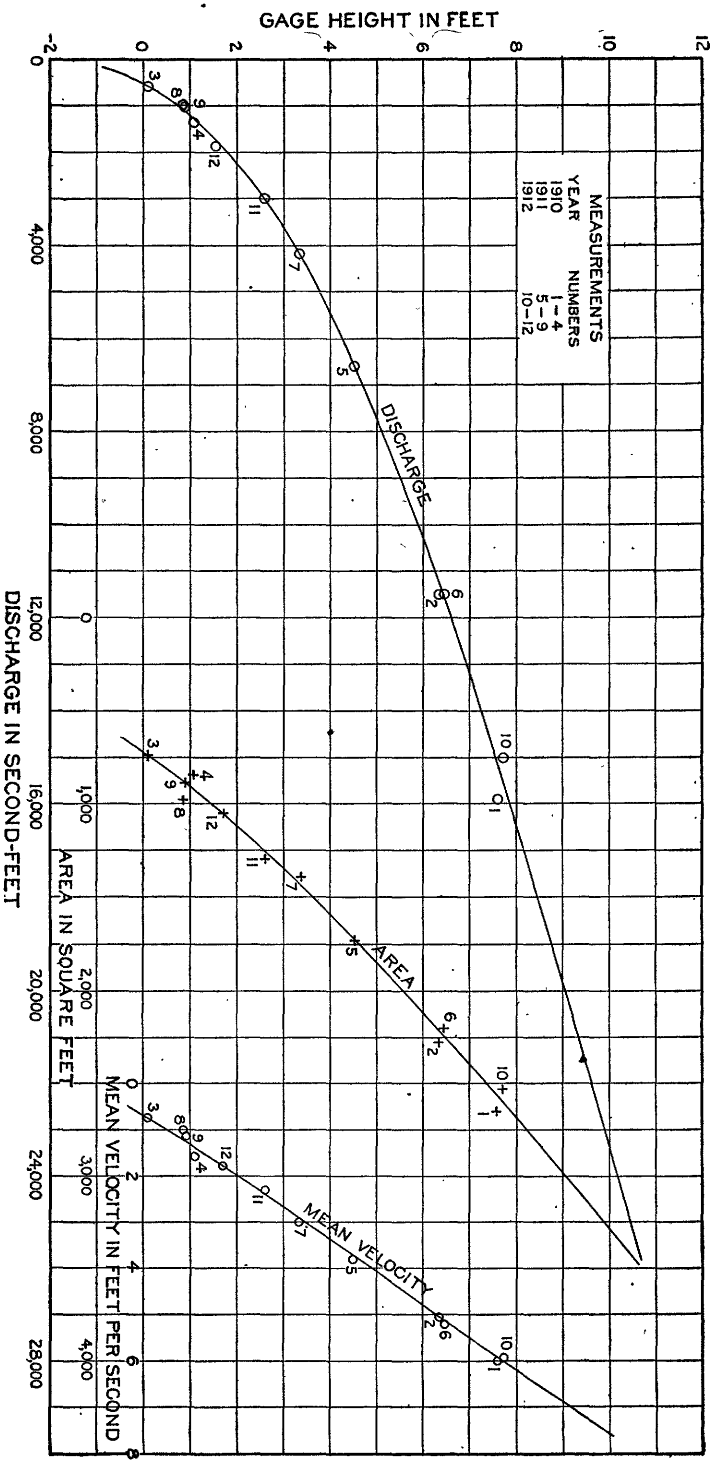


FIGURE 4.—Discharge, area, and mean-velocity curves of Fortymile River at Steel Creek.

THE NORRIS PETERS CO. WASHINGTON, D.C.

The discharge-measurement table gives the results of all discharge measurements made at the station. The gage heights give the daily fluctuations of the stream. They represent the elevation of the surface of the water above the arbitrary datum of the gage and not above the bed of the stream. The daily discharges are determined by application of a rating table to the gage heights.

At many stations it was impracticable to obtain an unbroken gage-height record. At some stations readings could be obtained only occasionally, and at others longer or shorter breaks in the record necessarily occurred. Whenever it was considered feasible the daily discharge for these periods has been estimated. These estimates have been based on the records obtained at the station itself, on the records of neighboring stations where conditions were comparable, and on a general knowledge of conditions.

For each drainage basin there are given all miscellaneous discharge measurements made in the basin at points other than the regular stations. The wide fluctuation of the streams render these miscellaneous data of rather uncertain value. With a few exceptions they represent the flow of the various streams at medium or low stages. Records at regular stations on neighboring streams should be studied and extreme precautions should be taken before basing any important work on these measurements.

ACCURACY OF DATA.

The accuracy of stream-flow data depends primarily on the natural conditions at the gaging stations and on the methods and care with which the data are collected.

The effect of poor channel conditions on the rating has been discussed. In a normal season errors from this cause should not be great at a station which is carefully established and rated.

Practically all current-meter measurements made under fair conditions are well within 5 per cent of the true discharge at the time of the observation. As the errors of meter measurements are largely compensating, the mean rating curve, when well defined, is much more accurate than the individual measurements. Numerous tests of the accuracy of current-meter work show that where conditions are good it compares very favorably with results from standard weirs.

The accuracy of the gage heights depends on the reliability of the observers, and this, with very few exceptions, is believed to be good. It is obvious that when a stream is frequently changing in stage, one reading or two readings per day may not give the mean height for the day. It seems probable, however, that errors from this source are compensating if the stage does not have a diurnal cycle and are greatly decreased in the monthly mean, although the reading for a single day may be considerably in error if taken by itself. This is especially likely to be true in the values of the maximum and minimum. The maximum should be increased considerably for many stations, and the minimum value should be taken as a mean of seven days or more rather than for one day.

The records of mean monthly discharge per square mile in second-feet and the run-off in depth in inches may be subject to errors resulting from a drainage area which is not well defined by available maps and to the wide variation in contribution to run-off over the drainage area.

In the table the line designated "Accuracy" shows the degree of reliability which it is believed the record possesses. It does not apply to the maximum or minimum, nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, and knowledge of local conditions. A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

REGULAR GAGING STATIONS.

In the following lists are given the names of gaging stations maintained in the Yukon-Tanana region by the United States Geological Survey and cooperative parties and the duration of the records at each station. Numbers are assigned the stations to aid in identifying their location on Plates X to XIII (in pocket). The stations are grouped under river basins in downstream order, tributaries of main streams being indicated by indention. The main stem of any stream is determined by the drainage area; that is, the headwater stream having the largest drainage is considered the continuation of the main stream and local changes in name are disregarded. (See Pl. IV.)

	No. on plate.
Yukon River basin:	
Yukon River at Eagle, 1911–12	1
Fortymile River basin:	
Main stem of Fortymile River:	
Dennison Fork at mouth, 1912	2
South Fork of Fortymile River at Franklin, 1910–1912	3
Fortymile River at Steele Creek, 1910–1912	4
South Fork of Fortymile River basin:	
Mosquito Fork at Kechumstuk, 1910–1912	5
Kechumstuk Creek at mouth, 1910–1912	6
Gold Creek at mouth, 1911	7
Walkers Fork above Poker Creek, 1912	8
Walkers Fork above Cherry Creek, 1911	9
Walkers Fork above Twelvemile Creek, 1910	10
Wade Creek at claim "No. 10 above," 1910–1912	11
Buckskin Creek above Fortyfive Pup, 1910–1912	12
Fortyfive Pup at claim No. 13, 1910–1912	13

Fortymile River basin—Continued.
South Fork of Fortymile River basin—Continued. No. on plate.
North Fork of Fortymile River at the "kink," 1910–1912 14
North Fork of Fortymile River above Middle Fork, 1910 15
Confederate Creek at mouth, 1912 16
Hutchinson Creek below Confederate Creek, 1911–12 17
Hutchinson Creek below Montana Creek, 1910–1912 18
Montana Creek at claim "No. 7 above," 1910–1912 19
King Solomon Creek at Liberty Cabin, 1911–12 20
Liberty Fork at mouth, 1911–12 21
Dome Creek at Auburn Mining Co. camp, 1912 22
Steele Creek at mouth, 1910–1912 23
Canyon Creek below Squaw Gulch, 1912 24
Canyon Creek, 1 mile below Squaw Gulch, 1910 25
Canyon Creek, 2 miles below Squaw Gulch, 1911 26
Squaw Gulch at claim "No. 1 above," 1910–1912 27
Mission Creek basin:
Mission Creek above Oregon Creek, 1911 28
Mission Creek above Colorado Creek, 1910 29
Wolf Creek above Swanson's dam, 1911 30
American Creek at claim "No. 8 above," 1910–1912 31
American Creek at United States pumping plant, 1910–11 32
Discovery Fork below Star Gulch, 1910–1912 33
Seventymile River basin:
Seventymile River above Flume Creek, 1910, 1912 34
Seventymile River at the falls, 1910–1912 35
Flume Creek one-fourth mile above mouth, 1910–1912 36
Alder Creek at claim "No. 7 above," 1910–1912 37
Barney Creek above ditch intake, 1910 38
Barney Creek ditch below forks, 1912 39
Sonickson Creek above ditch intake, 1910–1912 40
Washington Creek above dam, 1912 41
Crooked Creek below Eldorado Creek, 1910–1912 42
Fox Creek at Rolf's claim, 1911–12 43
Birch Creek basin:
Birch Creek above Twelvemile Creek, 1911 44
Birch Creek below Twelvemile Creek, 1911–12 45
Birch Creek below Great Unknown Creek, 1912 46
Birch Creek below Clums Fork, 1910–11 47
Birch Creek above Sheep Creek, 1911–12 48
Birch Creek at Fourteenmile House, 1908–1912 49
Mastodon Fork of Eagle Creek above ditch intake, 1909 50
Fryingpan Creek below forks, 1910 51
Great Unknown Creek at mouth, 1912 52
Clums Fork below Munson Creek, 1912 53
Lawson Creek at mouth, 1912 54
Buckley Bar Creek at mouth, 1911–12 55
Sheep Creek at mouth, 1911–12 56
Bachelor Creek below Costa Fork, 1909–10 57
Porcupine Creek above ditch intake, 1910 58
Porcupine Creek below ditch intake, 1912 59
Porcupine Creek below Bonanza Creek, 1908–1912 60

Birch Creek basin—Continued.
Birch Creek at Fourteenmile House, 1908–1912—Continued. No. on plate.
Crooked Creek at Central House, 1909–1912 61
Bonanza Creek above ditch intake, 1908–1910 62
Bonanza Creek below ditch intake, 1911–12 63
Independence Creek at claim "No. 9 above," 1911 64
Mammoth Creek at Miller House, 1908–1910 65
Miller Creek at mouth, 1911–12 66
Deadwood Creek above Switch Creek, 1909–1912 67
Portage Creek, 4 miles above Medicine Lake, 1912 68
Porcupine ditch at intake, 1912 69
Bonanza ditch at intake, 1910–1912 70
Bonanza ditch below junction with Porcupine branch, 1912 71
Bonanza ditch at outlet, 1911–12 72
Mammoth Creek diversion ditch, 1910 73
Beaver Creek basin:
Nome Creek, 4 miles above Moose Creek, 1912 74
Nome Creek above Ophir Creek, 1911–12 75
Hess Creek basin:
Troublesome Creek below Quail Creek, 1908–1910 76
Quail Creek at claim "No. 7 above," 1909 77
Quail Creek at claim "No. 9 below," 1909–10 78
Minook Creek basin:
Minook Creek above Little Minook Creek, 1908–9 79
Hoosier Creek at claim "No. 11 above," 1908–9 80
Little Minook Creek at claim "No. 9 above," 1908–9 81
Hunter Creek at claim "No. 17 above," 1908 82
Streams tributary to Tanana River (miscellaneous basins):
Banner Creek at mouth, 1909–10 83
Salcha River near mouth, 1909–10 84
Junction Creek above Moose Lake outlet, 1909–10, 1912 85
Chena River basin:
Chena River above Shamrock Creek, 1912 86
Chena River above Little Chena River, 1910–1912 87
North Fork of Chena River above Monument Creek, 1912 88
North Fork of Chena River below Monument Creek, 1912 89
Monument Creek at Chena Hot Springs, 1912 90
Little Chena River above Sorrels Creek, 1907–8, 1910 91
Little Chena River below Fish Creek, 1908, 1910 92
Sorrels Creek above Elliot Creek, 1907–8, 1910 93
Elliot Creek at mouth, 1907–8, 1910 94
Fish Creek below Solo Creek, 1910–1912 95
Fish Creek above Fairbanks Creek, 1907–8 96
Fish Creek at mouth, 1908, 1910 97
Miller Creek at mouth, 1908, 1910 98
Tolovana River basin:
Washington Creek above Aggie Creek, 1908 99
Washington Creek below Aggie Creek, 1908 100
Aggie Creek at mouth, 1908 101
McManus Creek at mouth, 1907, 1910–1912 102
Chatanika River below Faith Creek, 1907–8, 1910–1912 103

Tolovana River basin—Continued. No. on plate.
Chatanika River below Poker Creek, 1907-1912 104
Chatanika ditch near outlet, 1910 105
Faith Creek at mouth, 1907, 1911-12 106
Smith Creek above Pool Creek, 1911 107
Pool Creek at mouth, 1911 108
Charity Creek above Homestake Creek, 1910, 1912 109
Homestake Creek at mouth, 1910, 1912 110
Kokomo Creek above Alder Creek, 1907 111
Goldstream Creek at claim "No. 6 below," 1907 112
Baker Creek basin:
Baker Creek at road crossing, 1908 113
New York Creek at Thanksgiving ditch intake, 1908-9 114
California Creek at Thanksgiving ditch intake, 1908-9 115
Thanksgiving ditch near outlet, 1908-9 116
California branch of Thanksgiving ditch near outlet, 1908 117
Pioneer Creek above What Cheer Bar ditch intake, 1908-9 118
What Cheer Bar ditch at intake, 1909 119
Hutlinana Creek above Cairo Creek, 1908-9 120
Hutlinana Creek below Cairo Creek, 1908 121
Patterson Creek basin:
Sullivan Creek above Tofty ditch intake, 1908-9 122

YUKON RIVER DRAINAGE BASIN.

DESCRIPTION.

The Yukon River basin comprises the greater portion of the vast area lying between the Pacific Mountain system on the south and the Rocky Mountain system on the north. Over half of it lies in Canada, its tributaries rising far to the southeast in the rugged mountains of northeastern British Columbia and the Yukon Territory. The stream meanders northwesterly across the international boundary as far as the Arctic Circle, near which it gradually turns southwest and flows to Bering Sea. Heading in an area some portions of which are little more than a score of miles from the coast, it carries its drainage over 2,000 miles before finally discharging it into the sea. The following table, showing the approximate lengths and drainage areas of some of the principal rivers of North America, shows the Yukon to rank fifth in size of drainage area.

Length and drainage area of the principal rivers of North America.

Rivers.	Approximate length.	Approximate area of drainage basin.
	Miles.	*Sq. miles.*
Mississippi, with Missouri	6,000	1,244,000
Mackenzie	2,900	677,000
St. Lawrence	2,600	565,000
Winnipeg and Nelson	3,800	486,000
Yukon, with Lewes and Teslin	2,300	330,000
Colorado and Green	2,000	300,000
Columbia	1,200	259,000
Ohio and Allegheny	1,000	210,000

The main Yukon is formed by the junction of the Pelly and Lewes, about 1,500 miles above the mouth. The chief tributaries below this junction in downstream order are the White, Stewart, Porcupine, Chandalar, Tanana, and Koyukuk.

The drainage areas of the Yukon at various points along its course are shown in the following table:

Drainage areas of Yukon River at different points along its course.

Above—	Distance from mouth.[a]	Drainage area.
YUKON TERRITORY.	*Miles.*	*Sq. miles.*
White Horse	2,050	7,630
Dawson	1,534	115,000
ALASKA.		
Eagle	1,432	122,000
Fort Yukon	1,157	177,000
Rampart	914	206,000
Mouth	0	330,000

[a] Distances as determined by Northern Navigation Co.

Above Eagle the Yukon is in most places confined to one channel and is characterized by a swift current and occasional rapids. A general view of the Yukon Valley near Eagle is shown in Plate V, *A*. Below Eagle, in the vicinity of Fort Yukon, the river enters what is known as the Yukon Flats. For about 200 miles it flows rather sluggishly through a wide valley in many channels and sloughs which frequently shift, causing much difficulty in navigation. The topography of the valley then changes again, and to the mouth of the Tanana the river flows for over 100 miles through a stretch which has been called the Lower Ramparts because of the rampart-like walls which bound it. In its remaining 800 miles the Yukon meanders through a valley never less than 2 miles wide in many channels and is marked by numerous islands and sand bars. A more complete description of the Yukon basin is given by Brooks.[1]

A station was maintained on Yukon River at Eagle during 1911 and 1912 and daily gage-height records were obtained for the greater part of the open season. Previous to this very few data on the flow of the Yukon had been collected. Approximate measurements made by Dawson [2] at the confluence of Pelly and Lewes rivers gave a discharge of 66,955 second-feet late in the summer when the river was at about mean stage.

Ogilvie,[3] who made more careful measurements of the Yukon at the international boundary, gives considerable information as to the

[1] Brooks, A. H., The geography and geology of Alaska: U. S. Geol. Survey Prof. Paper 45, p. 64, 1906.

[2] Dawson, G. M., Yukon district and British Columbia: Geol. and Nat. Hist. Survey Canada Ann. Rept., vol. 3, pt. 1, p. 183, 1889.

[3] Ogilvie, William, The Klondike Official Guide, Buffalo, p. 56, 1898.

base of a willow at the top of the left bank 300 feet below the upper range line. The transit point at the upper end of the range line is marked by a witness stake and a pile of stones. Seven feet back from the transit point a 2-inch birch is blazed and marked by three notches. Two prominent poplars about 6 inches in diameter stand about 50 feet back of the point and a little downstream.

On April 24, 1911, the vertical velocity of the stream at the ice holes was determined by a Price current meter, and the discharge was computed as 10,100 second-feet. This is considered to be near the minimum discharge at Eagle for 1911 and it probably represents very closely the minimum from year to year. During May, 1911, seven discharge measurements were made by means of ice floats. In 1912 three measurements were made, two by driftwood floats and one by bottle floats.

The instruments used for these measurements were a transit and stop watch. The passage of ice cakes were timed over a run of 500 feet and their location was determined by a transit on the upstream range line. Two men decided upon a cake as it crossed the upper range, and while one man followed it with the transit telescope the other went down to the lower range and when the float crossed signaled the transit man and noted the time. For the bottle floats ordinary beer bottles, weighted with sand and marked with flags stuck in the necks, were used. White flags were found to be the most easily visible. The floats were dropped from a rowboat at intervals of about 75 feet across the stream above the upper range line.

Observations were also made to determine the coefficient required to reduce surface velocity to mean velocity. A rowboat with a sack of rocks as an anchor was employed. The very swift current of the Yukon, with depths of 20 to 30 feet, made the task difficult. It was found necessary to use 200 pounds of rocks to furnish sufficient anchorage. When observations at a point were completed the rope was cut, the boat pulled to the shore as quickly as possible, and then hauled back upstream far enough for another trial. The results of these observations indicated a coefficient of 0.92, somewhat higher than is found in most streams. This coefficient was used for the reduction of all discharge measurements. All the measurements plot within 3 per cent of the mean rating curve, except that of May 19, 1911, which plots 14 per cent greater, probably because of certain abnormal conditions of ice flow at the time of the measurement.

Besides the records of daily discharge for the period of gage-height records, there is given a table showing the mean monthly discharge, run-off in second-feet per square mile, and run-off in inches on the drainage area throughout 1911 and 1912. The portions of the years for which daily records were unavailable are based on the personal knowledge of conditions of winter flow and on miscellaneous measurements made through the ice. The error involved by such an estimate can not be great in its effect upon the total, for 77 per cent of the run-off for 1911 occurred in the 145 days of the gage-height record and 75 per cent of that in 1912 occurred in 155 days.

The maximum discharge for 24 hours as given by the record was 254,000 second-feet on May 22, 1911. The discharge has undoubtedly been considerably greater than this. The ordinary winter minimum has been estimated as about 10,000 second-feet, but this is probably rather excessive for the extreme minimum. The mean daily discharge for 1911 and 1912 is computed to be 88,300 second-feet.

The mean annual run-off in depth in inches in 1911 and 1912, distributed evenly over the drainage area of 122,000 square miles above Eagle, is 8.18 inches. The rainfall from November 1, 1910, to October 30, 1912, is believed to have been close to normal. It seems reasonable to assume from the available precipitation records (p. 23) that the normal rainfall in this area is approximately 12 inches. If these assumptions are correct, the run-off from this area exceeds 60 per cent of the precipitation. Comparison of this result with various basins in the United States throws doubt on the accuracy of so high a percentage of run-off. As has already been shown, the drainage area of the Yukon presents decidedly different conditions from those in most river basins of the United States.

The extensive areas of frozen ground are an obstacle to percolation, for when the upper layer of thawed earth is saturated the rainfall can only seek its way to the nearest watercourse, and it therefore escapes with a minimum of the losses which are promoted by percolation. The climate and topography are unfavorable for great losses by evaporation, and losses due to vegetation are small because the summer is too short and cool for luxuriant plant growth.

It seems safe to state that the run-off per square mile from the drainage area of the Yukon above Eagle exceeds that of half the area of the United States.

Discharge measurements of Yukon River at Eagle, Alaska, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
Apr. 24		[a] 10,100	May 22	11.90	[b] 253,300
May 9	2.90	[b] 125,200			
10	3.10	[b] 125,200	1912.		
16	2.40	[b] 121,400	May 21	3.45	[c] 126,800
19	7.50	[b] 215,600	July 29	9.65	[c] 222,900
20	10.10	[b] 234,700	Sept. 14	−2.00	[d] 68,200
21	11.25	[b] 237,700			

[a] Measurement with current meter under ice.
[b] Measurement with ice floats.
[c] Measurement with floating driftwood.
[d] Bottle floats used for determining velocities.

discharge. In December, 1895, the discharge was estimated at about 96,000 second-feet, the mean summer flow at about 135,000 second-feet, and the flood flow at 180,000 to 225,000 second-feet. Results at Eagle, about 12 miles below, show that Ogilvie's estimate of a mean summer discharge of 135,000 is approximately correct, but that his estimates for winter flow and flood flow are too small.

On September 8, 1899, when the Yukon was at a low summer stage, a discharge measurement made 73 miles above the mouth by the Coast and Geodetic Survey gave 436,000 second-feet.

Miscellaneous measurements were made of the Fiftymile River at Whitehorse, Yukon Territory, in 1908 and of the Yukon at Rampart in the spring of 1909. (See pp. 66–67.)

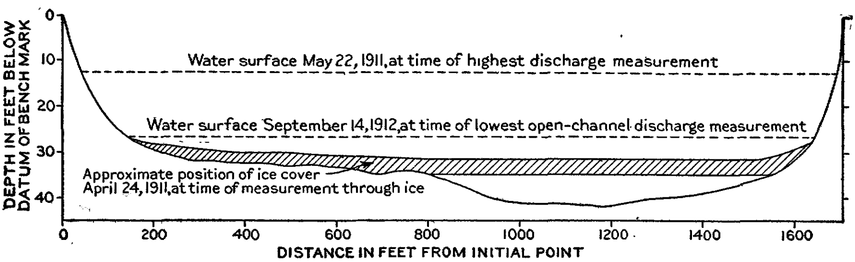


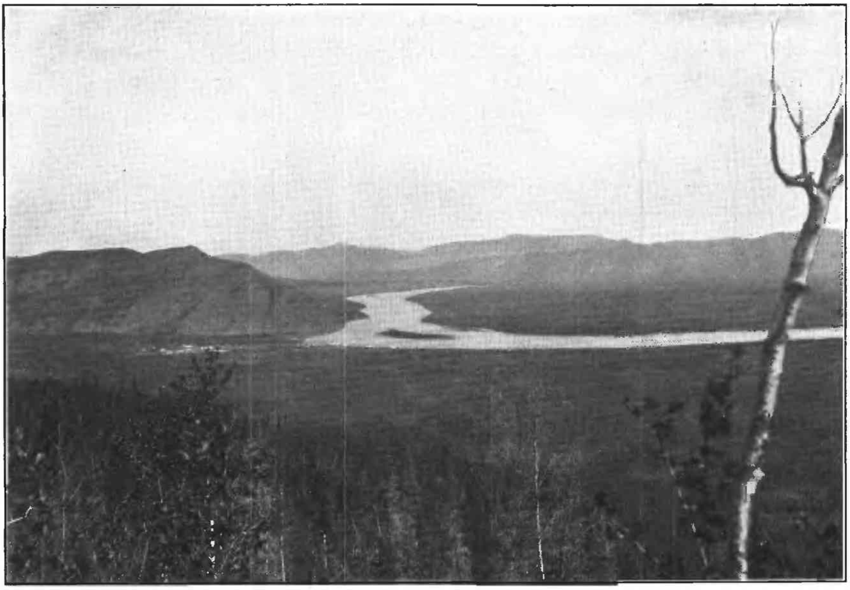
FIGURE 5.—Cross section of Yukon River at measuring section at Eagle.

YUKON RIVER AT EAGLE.[1]

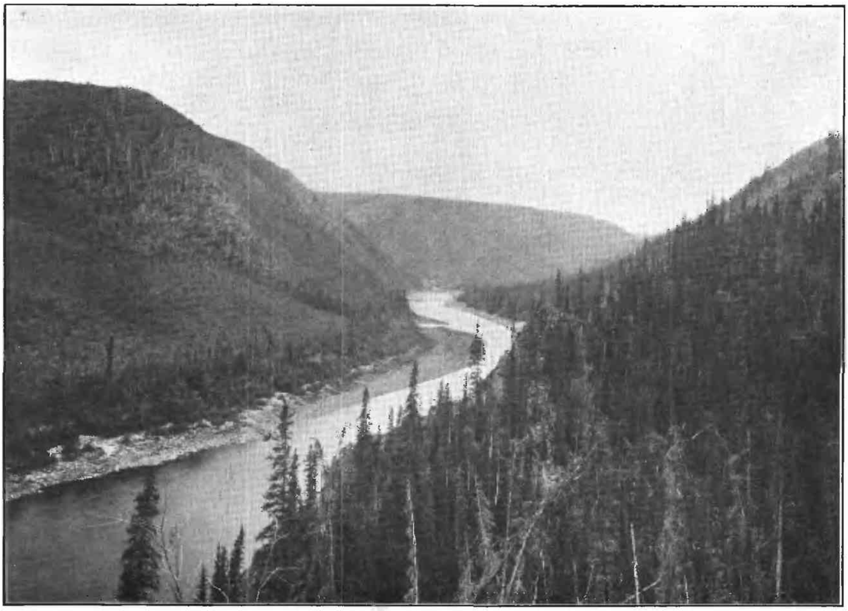
In May, 1911, a gage was established on Yukon River at Eagle, and gage readings were made from May 9 to September 30, 1911, and from May 20 to October 21, 1912. The gage consisted of a white strip about 3 feet wide painted on the rock face of a high bluff just below the town of Eagle (see Pl. V, *A*), and graduated in black paint at intervals of a quarter of a foot, the even feet being marked by numbers sufficiently large to enable the gage to be read from Eagle, about half a mile distant, by telescope. The observer read the gage to one-eighth of a foot.

Discharge measurements were made about 2 miles above Eagle by floats on a straight stretch of channel about 1,000 feet long whose cross section was believed to be practically uniform. The river at this point is about 1,600 feet wide. About midlength of the proposed run for the float the cross section was determined by cutting holes through the ice at intervals of 50 feet and making soundings at each hole. The exposed section was determined by levels and, together with the section obtained by soundings, was referred to a permanent bench mark. (See fig. 5.) The bench mark is a notch cut in the

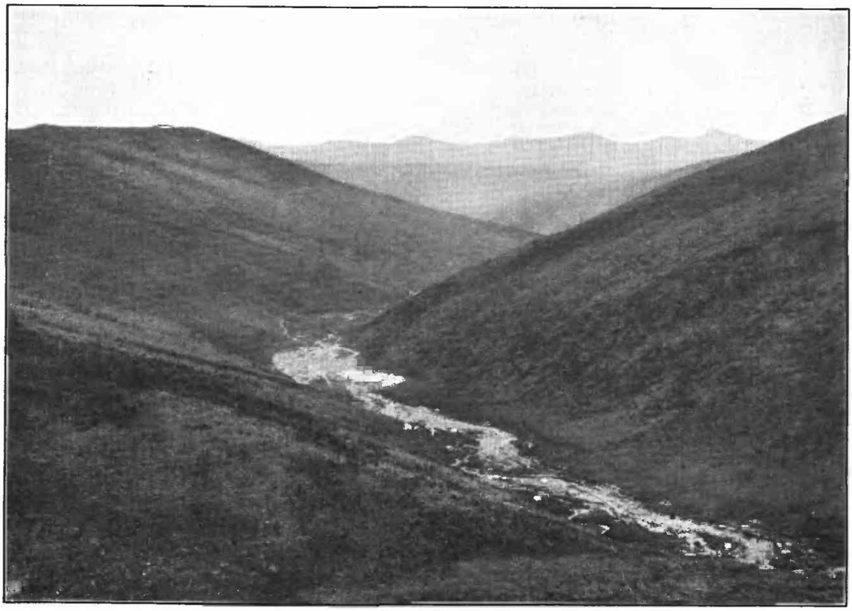
[1] For a fuller description of this station and its record of discharge for 1913, see Porter, E. A., and Davenport, R. W., The discharge of Yukon River at Eagle, Alaska: U. S. Geol. Survey Water-Supply Paper 345–F, 1914.



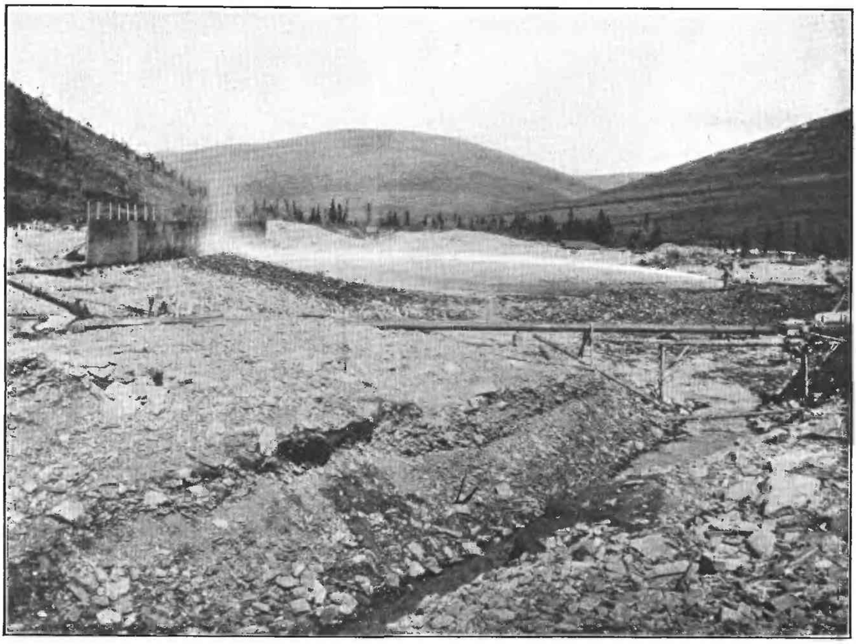
A. YUKON RIVER AT EAGLE.



B. FORTYMILE RIVER BELOW STEEL CREEK.



A. TYPICAL TOPOGRAPHY, MASTODON CREEK.



B. HYDRAULICKING ON EAGLE CREEK.

Monthly discharge of Yukon River at Eagle, Alaska, 1911 and 1912.

Month.	Discharge in second-feet.				Run-off (depth in inches).	
	Mean.		Per square mile.			
	1911	1912	1911	1912	1911	1912
January	21,000	21,000	0.172	0.172	0.20	0.20
February	15,000	15,000	.123	.123	.13	.13
March	11,000	11,000	.090	.090	.10	.10
April	12,000	12,000	.098	.098	.11	.11
May	156,000	125,000	1.28	1.02	1.48	1.18
June	184,000	160,000	1.51	1.32	1.68	1.47
July	178,000	147,000	1.46	1.20	1.68	1.38
August	139,000	127,000	1.14	1.04	1.31	1.20
September	106,000	73,600	.869	.603	.97	.67
October	60,000	51,000	.492	.418	.57	.48
November	37,000	37,000	.303	.303	.34	.34
December	28,000	28,000	.230	.230	.27	.27
The year					8.84	7.35

Daily gage height, in feet, and discharge, in second-feet, of Yukon River at Eagle, Alaska, for 1911–12.

[Drainage area, 122,000 square miles. Observers: Jay Mattison, 1911; W. P. Thrall, 1912.]

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.												
1			8.9	210,000	7.9	194,000	4.9	151,000	1.5	108,000		
2			8.0	196,000	7.8	193,000	4.8	150,000	2.0	112,000		
3			7.5	188,000	7.1	182,000	4.5	146,000	4.5	146,000		
4			6.9	180,000	7.0	181,000	4.8	150,000	4.0	138,000		
5			6.4	172,000	6.9	180,000	5.0	125,000	3.8	136,000		
6			6.5	174,000	6.8	178,000	5.5	160,000	3.2	128,000		
7			6.4	172,000	7.0	181,000	5.5	160,000	3.0	125,000		
8			6.0	166,000	7.1	182,000	5.0	152,000	2.5	118,000		
9	2.9	124,000	6.9	180,000	7.2	184,000	4.9	151,000	2.1	114,000		
10	3.1	126,000	6.8	178,000	7.4	187,000	4.4	144,000	1.9	111,000		
11		123,000	6.6	175,000	8.6	205,000	4.2	141,000	1.5	108,000		
12		120,000	6.5	174,000	8.2	199,000	4.0	138,000	1.5	108,000		
13		117,000	6.2	169,000	7.4	187,000	4.1	140,000	2.0	112,000		
14	2.2	115,000	7.0	181,000	7.0	181,000	4.1	140,000	1.9	111,000		
15	2.4	117,000	6.4	172,000	6.0	166,000	4.0	138,000	1.6	109,000		
16	2.5	118,000	6.2	169,000	6.2	169,000	3.9	137,000	1.4	106,000		
17	2.4	117,000	6.5	174,000	7.8	193,000	3.9	137,000		105,000		
18	4.0	138,000	7.0	181,000	9.0	211,000	4.2	141,000		103,000		
19	7.2	184,000	8.0	196,000	8.0	196,000	4.8	150,000		102,000		
20	10.4	232,000	8.2	199,000	7.2	184,000	4.6	147,000		100,000		
21	11.2	244,000	8.4	202,000	6.6	175,000	4.5	146,000		98,000		
22	11.9	254,000	8.5	204,000	6.0	166,000	4.2	141,000		96,000		
23	11.5	248,000	8.1	198,000	5.9	165,000	4.0	138,000		94,000		
24	10.1	228,000	7.8	193,000	5.9	165,000	3.9	137,000		92,000		
25	9.2	214,000	7.4	187,000	5.5	160,000	3.5	132,000	0.1	90,600		
26	7.0	181,000	6.5	174,000	6.0	166,000	3.0	125,000		88,000		
27	6.9	180,000	7.0	181,000	5.6	161,000	2.5	118,000	−0.5	84,000		
28	6.5	174,000	7.8	193,000	5.5	160,000	2.2	115,000		82,000		
29	6.5	174,000	8.0	196,000	5.5	160,000	2.0	112,000		80,000		
30	6.6	175,000	8.0	196,000	5.4	158,000	1.9	111,000		78,000		
31	7.5	188,000			5.8	164,000	1.5	108,000				
Mean discharge		169,000		184,000		178,000		139,000		106,000		
Second-feet per square mile		1.39		1.51		1.46		1.14		0.869		
Run-off (depth in inches on drainage area)		1.19		1.68		1.68		1.31		0.97		
Maximum		254,000		210,000		211,000		160,000		146,000		
Minimum		115,000		166,000		158,000		108,000		78,000		
Accuracy		A		A		A		A		A		

Daily gage height, in feet, and discharge, in second-feet, of Yukon River at Eagle, Alaska, for 1911-12—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1	......	......	10.2	229,000	3.7	134,000	7.5	188,000	......	89,000	......	64,000
2	......	......	10.2	229,000	3.5	132,000	6.5	174,000	−0.2	87,300	−2.5	63,500
3	......	......	10.2	229,000	3.0	125,000	6.1	168,000	......	85,500	......	62,000
4	......	......	9.4	217,000	2.8	122,000	5.0	152,000	− .5	84,000	−3.0	59,000
5	......	......	7.8	193,000	2.8	122,000	4.5	146,000	......	82,000	......	58,000
6	......	......	5.9	165,000	3.2	128,000	4.2	141,000	......	80,000	......	57,000
7	......	......	4.5	146,000	4.0	138,000	3.9	137,000	......	78,000	......	56,000
8	......	......	3.3	129,000	4.8	150,000	4.7	148,000	......	77,000	......	55,000
9	......	......	2.6	120,000	4.8	150,000	4.0	138,000	......	76,000	......	54,000
10	......	......	2.5	118,000	......	147,000	3.7	134,000	......	74,000	......	53,000
11	......	......	2.5	118,000	......	144,000	3.2	128,000	......	72,000	......	52,500
12	......	......	2.7	121,000	......	141,000	4.5	146,000	−1.8	70,000	......	52,000
13	......	......	3.1	126,000	......	138,000	4.7	148,000	......	69,000	......	51,500
14	......	......	3.5	132,000	3.8	136,000	5.7	162,000	−2.0	68,000	......	51,000
15	......	......	3.8	136,000	3.7	134,000	5.0	152,000	−2.1	67,100	......	50,500
16	......	......	4.1	140,000	3.5	132,000	3.0	125,000	−2.2	66,200	−4.0	50,000
17	......	......	6.2	169,000	3.2	128,000	2.8	122,000	−1.5	73,000	......	49,500
18	......	......	7.0	181,000	3.0	125,000	2.2	115,000	......	76,000	......	49,000
19	......	......	6.8	178,000	2.8	122,000	2.0	112,000	−1.0	78,500	......	48,500
20	3.6	133,000	6.3	171,000	2.8	122,000	2.0	112,000	......	76,000	......	48,000
21	3.4	130,000	5.7	162,000	2.8	122,000	1.9	111,000	......	74,000	......	[a] 47,500
22	3.2	128,000	5.4	158,000	3.2	128,000	1.7	110,000	......	72,000	......	......
23	3.5	132,000	6.0	166,000	4.3	143,000	1.4	106,000	......	70,000	......	......
24	3.7	134,000	7.0	181,000	6.0	167,000	1.2	103,000	−2.0	68,000	......	......
25	4.5	146,000	7.1	182,000	6.2	169,000	.8	98,300	......	67,000	......	......
26	5.2	155,000	7.1	182,000	5.8	164,000	......	97,000	......	66,500	......	......
27	6.4	172,000	6.2	169,000	5.4	158,000	......	95,500	......	66,000	......	......
28	7.1	182,000	5.5	160,000	7.1	182,000	......	94,500	......	65,500	......	......
29	7.9	194,000	4.8	150,000	10.0	226,000	......	93,000	......	65,000	......	......
30	8.8	208,000	4.0	138,000	10.9	240,000	......	92,000	......	64,500	......	......
31	9.8	223,000	......	......	8.0	196,000	......	90,500	......	......	......	......
Mean discharge	......	161,000	......	160,000	......	147,000	......	127,000	......	73,600	......	53,900
Second-feet per square mile	......	1.32	......	1.32	......	1.20	......	1.04	......	0.603	......	0.442
Run-off (depth in inches on drainage area)	......	0.59	......	1.47	......	1.38	......	1.20	......	0.67	......	0.35
Maximum	......	223,000	......	229,000	......	240,000	......	188,000	......	89,000	......	64,000
Minimum	......	128,000	......	118,000	......	122,000	......	90,500	......	64,500	......	47,500
Accuracy	......	A	......	A	......	A	......	A	......	A	......	A

[a] Ice commenced running.

YUKON RIVER AT RAMPART.

A cross section and a discharge measurement were obtained on May 1, 1909, just above the mouth of Rampart Creek, which is a small tributary from the south at the lower end of the town of Rampart. The bed is thought to be semipermanent and the channel is straight for at least 1,000 feet above and below the point of measurement. The banks on each side are high, with long gentle slopes. The left slope is of cemented gravel and bowlders; the right is of small gravel and is liable to slight changes. At the time the cross section was made the ice varied in thickness from 4 to 4½ feet, which was probably the maximum for the winter. The width of the section at the highest level of the ice was 1,560 feet, and its width at the water's surface was 1,300 feet, so that for 250 feet the ice was in contact with the bed. The stage of the river at the time of the first ice cover in the fall was considerably higher than at the time of the measurement, and as the water lowered its width decreased and the ice sheet fell, coming into contact with the previously submerged sloping bank. The greatest depth of water below the bottom of the ice was found to be 15.9 feet at a distance of 420 feet from the left edge of the ice.

On May 19 and 21, 1909, two float measurements were made by timing ice cakes over a 500-foot range. The distance of the ice cakes from the shore was estimated, but it is believed no large error was introduced by this, for the velocity and section were very uniform. The measurements are considered to be only approximate. The stage was considerably above the mean for the summer.

Discharge measurements of Yukon River at Rampart, 1909.

Date.	Width.	Area.	Mean velocity.	Discharge.	Gage height.	Drainage area.	Discharge per square mile.
	Feet.	*Sq. ft.*	*Ft. pr. sec.*	*Sec.-ft.*	*Feet.*	*Sq. mi.*	*Sec.-ft.*
May 1	1,360	11,700	0.93	10,900	[a] 51.6	206,000	0.05
May 19	1,750	58,100	6.32	367,000	80.9	206,000	1.78
May 21	1,750	58,500	6.31	369,000	81.1	206,000	1.79

[a] Bottom of the ice.

FIFTYMILE RIVER AT WHITEHORSE, YUKON TERRITORY.

Since 1902 the White Pass & Yukon Railroad Co. has kept daily records of the stage of Fiftymile River at Whitehorse and of the dates of opening and closing of navigation. In the spring of 1908 members of the United States Geological Survey, on their way to the interior of Alaska, made the following measurements of the river at this point:

Miscellaneous measurements of Fiftymile River at Whitehorse, Yukon Territory, 1908.

Date.	Gage height.	Discharge.	Drainage area.	Discharge per square mile.
	Inches.	*Sec.-ft.*	*Sq. miles.*	*Sec.-ft.*
June 10	9½	4,490	7,630	0.588
June 16	16⅝	5,100	7,630	.668

FORTYMILE RIVER DRAINAGE BASIN.

DESCRIPTION.

Fortymile River is tributary to Yukon River in the Yukon Territory at longitude 140° 30′ west and latitude 64° 30′ north, about 50 miles below Dawson, Yukon Territory, and about the same distance above Eagle, Alaska. The main river rises in Alaska and enters Canadian territory about 23 miles above its mouth. Some of its southern tributaries also rise in Canadian territory. Of its total drainage area of

6,350 square miles, about 4 per cent lies in Canadian territory. The area is roughly fan-shaped, the extreme diametric dimensions being approximately 100 miles. The stream flow is predominantly from west to east. About 40 miles in an air line from its mouth the river divides into North and South forks, and again these subdivide somewhat symmetrically into other forks. These tributaries will be described more in detail on later pages.

On the north the tributaries interlock with those of Mission Creek and Seventymile and Charley rivers in high, rocky ridges, of which Glacier Mountain is the most prominent. From the west Goodpaster, Volkmar, and Healy rivers take the adjoining drainage from mountains equally rugged. In the southeast the streams head in a country of relatively low relief at a distance of only a few miles from Tanana River. Ladue Creek and Sixtymile River form the opposing drainage on the east and southeast, the moderately low dividing range being accentuated by several large dome-shaped mountains.

A prominent feature of the lower Fortymile basin is the well-defined bench which marks the elevation of an earlier valley floor. In the vicinity of Steel Creek this bench is about 500 feet above the stream bed. The planes of the present and of the older valley floors coincide near the mouth of Kechumstuk Creek at an elevation of about 2,000 feet above sea level. A view of the Fortymile Valley just below Steel Creek is shown in Plate V, *B*.

MAIN STEM OF FORTYMILE RIVER.

DESCRIPTION.

The main stem of Fortymile River, as determined by the area of drainage, consists of sections named in downstream order Dennison Fork, South Fork, and Fortymile River, Dennison Fork joining Mosquito Fork to form the South Fork.

Dennison Fork has its source in a country characterized by wide swampy valleys which slope gently into fairly high mountains. The ridge separating its drainage from that of Tanana River parallels the Tanana at a distance varying from 4 to 10 miles. Its drainage area of 1,540 square miles is about equally divided between two forks which unite to form the main stream about 12 miles above its mouth.

DENNISON FORK AT MOUTH.

This station was located about one-half mile above the junction with Mosquito Fork, one-half mile below the mouth of a small tributary from the right known as Deep Creek, and 2½ miles south of Chicken post office.

A gage was installed and one discharge measurement was made in 1911. This gage was carried out by the high water of June 17, 1912, and a second was installed by the observer on June 19, all

1912 measurements being referred to the latter. The relation between the two gages was determined approximately from the 1911 measurement and all gage readings before June 17 were reduced to the datum of the 1912 gage.

The drainage area of Dennison Fork is nearly one-fourth that of Fortymile River at the mouth. Some prospecting has been done in its basin, but no attractive discoveries have been made and there are practically no settlers in the entire area. The meager records give some idea of the character of its flow. It is believed that the run-off for June, 1912, was abnormally large and that the discharge of 6,500 second-feet on June 17 is nearly the maximum for this stream. It is estimated that the minimum summer discharge is less than 100 second-feet.

Discharge measurements of Dennison Fork at mouth, 1911 and 1912.

Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec-ft.*
Aug. 23	0.80	139
1912.		
July 9	1.05	203
Aug. 15	2.08	807
Aug. 16	1.87	625

Daily gage height, in feet, and discharge, in second-feet, of Dennison Fork at mouth, for 1912.

[Drainage area, 1,540 square miles. Observer, J. V. Anderson.]

Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.25	970		
2			1.90	650	0.80	135
3			1.70	515		
4			1.50	396		
5			1.35	324		
6	3.40	2,360	1.20	260		
7	3.20	2,080		240		
8	3.00	1,840		220		
9	2.65	1,420	1.05	203		
10	2.50	1,240		190		
11	2.30	1,020		180		
12	2.65	1,420		170		
13	2.95	1,780		160		
14	2.90	1,720	.85	148		
15	3.00	1,840			2.10	820
16	5.00	4,960			1.85	615
17	5.80	6,500				
18		5,400				
19	4.60	4,280				
20	4.00	3,260				
21	3.80	2,940				
22		2,780				
23		2,780				
24	3.60	2,640				
25	3.20	2,080				

Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
26	3.50	2,500				
27	3.40	2,360				
28	3.60	2,640				
29	2.80	1,600				
30	2.50	1,240				
31						
Mean discharge		2,590		330		
Second-feet per square mile		1.68		0.214		
Run-off (depth in inches on drainage area)		1.56		0.11		
Maximum		6,500		970		
Minimum		1,020		148		
Accuracy		C		B		

SOUTH FORK OF FORTYMILE RIVER DRAINAGE BASIN.

DESCRIPTION.

Mosquito Fork, which joins Dennison Fork from the north to form South Fork, heads at an elevation of 3,000 to 4,000 feet in a ridge paralleling Tanana River about 20 miles from that stream and flows generally northeast for about 75 miles. Its drainage area comprises 1,120 square miles. Chicken Creek, the first tributary above the mouth, though of small drainage area, is economically important as a gold producer. Gold Creek joins from the north about 20 miles above Dennison Fork, and Kechumstuk Creek enters from the same side about 8 miles farther upstream. Near the mouth of Kechumstuk Creek, at an elevation of about 2,000 feet, an abrupt decrease in stream gradient is noticeable, and the valley above this place widens and becomes swampy. The valley floor narrows again about 8 miles above, at a point where a spur from the south approaches the stream. This spur marks the lower end of the flat swampy area known as Mosquito Flats, which constitutes a large portion of the upper drainage area of Mosquito Fork. These flats extend along the stream for about 20 miles, and at some places are 12 to 14 miles wide. They are a tangle of lakes and sloughs, and it is said that during a wet season they are practically covered with water.

The principal tributaries to South Fork below the junction of Dennison and Mosquito forks are Atwater Creek, Walker Fork, Napoleon, Franklin, Buckskin, Uhler, and Butte creeks. The largest of these is Walker Fork, and it is also the most important because of the placer gold produced by its tributaries. The more prominent of these are Poker, Davis, Cherry, and Twelvemile creeks, Liberty Fork, and Wade Creek.

SOUTH FORK AT FRANKLIN.

This station was located about 50 yards above the mouth of Franklin Creek and 75 yards from the Franklin road house. It was established on July 9, 1910, and records have been obtained for three seasons. Discharge measurements were made from a boat at high stages and by wading at low. Freshets, which bring gravel down Franklin Creek and deposit it below the gage, have caused slight changes in the control and, consequently, in the ratings, but the discharges are nevertheless believed to be very reliable. The maximum discharge for the period of the records was 12,600 second-feet on June 17, 1912. This is reported by the settlers to have been the highest stage for many years. The discharge reached a minimum of 134 second-feet on August 4 and 5, 1910.

Discharge measurements of South Fork of Fortymile River at Franklin, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
July 10	2.71	651	July 15	5.40	4,130
Aug. 3	2.22	154	16	5.94	4,890
4	2.20	146	Aug. 22	2.33	455
11	3.88	2,470	28	2.05	204
15	2.77	800	1912.		
1911.			June 7	4.94	3,860
May 25	4.30	2,900	July 8	2.50	522
31	5.26	3,870	Aug. 11	2.82	1,100
June 2	4.17	2,460	11	3.75	2,210
July 11	2.75	905	12	6.21	6,550

Daily gage height, in feet, and discharge, in second-feet, of South Fork of Fortymile River at Franklin for 1910–1912.

[Drainage area, 3,180 square miles. Observer, John Roberts.]

Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.
1910.						
1	......	......	2.25	179	2.50	420
2	......	......	2.25	179	2.50	420
3	......	......	2.23	166	2.54	468
4	......	......	2.21	153	2.54	468
5	......	......	2.21	153	2.50	420
6	......	......	2.17	134	2.50	420
7	......	......	2.17	134	2.50	420
8	......	......	2.25	179	2.50	420
9	2.75	735	5.38	5,120	2.50	420
10	2.71	683	4.79	4,060	2.50	420
11	2.67	631	3.92	2,530	2.50	420
12	2.60	540	3.54	1,900	2.50	420
13	2.73	709	3.23	1,420	2.50	420
14	2.85	870	2.92	968	2.54	468
15	2.83	842	2.79	787	2.54	468
16	2.85	870	2.73	709	2.58	516
17	2.88	912	2.77	761	2.58	516
18	2.85	870	2.83	842	2.67	631
19	2.50	420	2.83	842	2.67	631
20	2.46	372	2.73	709	2.67	631
21	2.42	324	2.67	631	2.67	631
22	2.42	324	2.67	631	2.62	566
23	2.42	324	2.67	631	2.62	566
24	2.42	324	2.67	631	2.58	516
25	2.42	324	2.67	631	2.58	516
26	2.38	282	2.62	566	2.58	516
27	2.33	237	2.62	566	2.58	516
28	2.33	237	2.62	566	2.54	468
29	2.33	237	2.58	516	2.54	468
30	2.33	237	2.54	468	2.50	420
31	2.33	237	2.54	468	......	......
Mean discharge	......	502	......	911	......	487
Second-feet per square mile	......	0.158	......	0.286	......	0.153
Run-off (depth in inches on drainage area)	......	0.13	......	0.33	......	0.17
Maximum	......	912	......	5,120	......	631
Minimum	......	237	......	134	......	420
Accuracy	......	A	......	B	......	A

Daily gage height, in feet, and discharge, in second-feet, of South Fork of Fortymile River at Franklin for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.												
1			4.77	3,240	2.20	340	2.20	340	2.00	200		
2			4.27	2,560	2.20	340	2.20	340	2.00	200		
3			4.07	2,300	2.20	340	2.20	340	2.00	200		
4			3.97	2,170	2.20	340	2.10	265	2.00	200		
5			4.01	2,210	2.20	340	2.10	265	2.00	200		
6			4.12	2,340	2.20	340	2.10	265	2.00	200		
7			3.82	1,950	3.00	1,040	2.10	265	2.00	200		
8			3.77	1,910	3.20	1,250	2.00	200	2.00	200		
9			2.90	940	2.65	705	2.00	200	2.00	200		
10			2.50	575	2.75	795	2.00	200	2.00	200		
11			2.50	575	2.70	750	2.00	200	2.05	232		
12			2.50	575	2.70	750	2.15	302	2.20	340		
13			2.50	575	2.65	705	2.20	340	2.30	415		
14			2.50	575	2.60	660	2.30	415	2.40	495		
15			2.40	495	4.75	3,210	2.30	415	2.40	495		
16			2.40	495	5.40	4,140	2.30	415	2.40	495		
17			2.40	495	5.10	3,700	2.30	415	2.30	415		
18			2.40	495	4.00	2,210	2.40	495	2.30	415		
19	7.57	[a]7,000	2.40	495	3.35	1,420	2.40	495	2.20	340		
20		[a]6,000	2.30	415	2.65	705	2.40	495	2.20	340		
21		[a]5,000	2.30	415	2.60	660	2.40	495				
22		[a]4,000	2.30	415	2.50	575	2.30	415				
23		[a]3,000	2.30	415	2.40	495	2.25	378				
24		[a]3,000	2.30	415	2.35	455	2.30	415				
25	4.37	2,690	2.20	340	2.30	415	2.20	340				
26	4.67	3,100	2.20	340	2.30	415	2.20	340				
27	4.37	2,690	2.20	340	2.25	378	2.15	302				
28	3.97	2,170	2.20	340	2.25	378	2.10	265				
29	3.67	1,780	2.20	340	2.20	340	2.10	265				
30	4.07	2,300	2.20	340	2.20	340	2.10	265				
31	5.37	4,100			2.20	340	2.10	265				
Mean discharge		3,600		970		932		336		299		
Second-feet per square mile		1.13		0.305		0.293		0.106		0.094		
Run-off (depth in inches on drainage area)		0.55		0.34		0.34		0.12		0.07		
Maximum		7,000		3,240		4,140		495		495		
Minimum		1,780		340		340		200		200		
Accuracy		C		B		B		B		B		

Discharge estimated.

Daily gage height, in feet, and discharge, in second-feet, of South Fork of Fortymile River at Franklin for 1910-1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1	2.65	735	4.50	3,260	3.15	1,380	2.20	440	2.60	820	2.60	820
2	2.80	930	5.15	4,170	3.05	1,260	2.30	520	2.60	820	2.60	820
3	2.90	1,060	7.5	7,600	3.00	1,190	2.45	660	2.60	820	2.45	660
4	3.10	1,320	7.2	7,180	2.75	865	2.50	710	2.60	820	2.40	610
5	3.10	1,320	6.4	5,960	2.50	550	2.50	710	2.50	710	2.40	610
6	3.20	1,450	5.60	4,800	2.40	450	2.65	875	2.50	710	2.30	520
7	3.30	1,580	4.80	3,680	2.40	450	2.90	1,150	2.50	710	2.25	480
8	3.75	2,210	4.20	2,840	2.50	550	2.90	1,150	2.60	820	2.20	440
9	4.70	3,540	3.85	2,350	2.45	500	2.90	1,150	2.70	930	2.20	440
10	4.40	3,120	3.65	2,070	2.40	450	2.80	1,040	2.80	1,040	2.15	405
11	4.75	3,610	3.45	1,790	2.35	405	3.85	2,350	2.85	1,100	2.10	370
12	4.70	3,540	3.45	1,790	2.30	360	6.50	6,100	3.00	1,260	2.10	370
13	4.70	3,540	4.15	2,770	2.30	360	5.25	4,310	2.95	1,200	2.10	370
14	4.80	3,680	5.20	4,240	2.20	290	3.95	2,490	2.85	1,100	......	......
15	4.60	3,400	7.0	6,900	2.20	290	3.60	2,000	2.65	875	......	......
16	4.25	2,910	8.1	8,560	2.20	290	3.25	1,560	2.55	765	......	......
17	4.10	2,700	10.5	12,600	2.20	290	3.00	1,260	......	765	......	......
18	3.90	2,420	10.0	11,700	2.20	290	2.90	1,150	3.20	1,500	......	......
19	3.55	1,930	8.4	9,040	2.10	230	3.00	1,260	3.55	1,930	......	......
20	3.55	1,930	8.4	9,040	2.10	230	2.90	1,150	3.85	2,350	......	......
21	3.55	1,930	7.2	7,180	2.10	230	2.90	1,150	3.60	2,000	......	......
22	3.40	1,720	7.1	7,040	3.55	1,930	2.80	1,040	3.50	1,860	......	......
23	3.20	1,450	7.0	6,900	2.85	1,100	2.70	930	3.20	1,500	......	......
24	3.10	1,320	6.0	5,400	2.80	1,040	2.70	930	3.05	1,320	......	......
25	3.00	1,190	5.25	4,310	2.70	930	2.70	930	2.85	1,100	......	......
26	3.00	1,190	5.00	3,960	2.60	820	2.70	930	2.85	1,100	......	......
27	2.90	1,060	4.80	3,680	2.50	710	2.80	1,040	2.85	1,100	......	......
28	2.80	930	4.75	3,610	2.40	610	2.80	1,040	2.85	1,100	......	......
29	4.85	3,750	4.55	3,330	2.30	520	2.80	1,040	2.85	1,100	......	......
30	6.1	5,540	3.95	2,490	2.30	520	2.70	930	2.80	1,040	......	......
31	4.80	3,680	......	......	2.40	610	2.70	930	......	......	......	......
Mean discharge	......	2,280	......	5,340	......	635	......	1,380	......	1,140	......	532
Second-feet per square mile	......	0.717	......	1.68	......	0.200	......	0.437	......	0.358	......	0.167
Run-off (depth in inches on drainage area)	......	0.83	......	1.87	......	0.23	......	0.50	......	0.40	......	0.08
Maximum	......	5,540	......	12,600	......	1,930	......	6,100	......	2,350	......	820
Minimum	......	735	......	1,790	......	230	......	440	......	710	......	370
Accuracy	......	B	......	B	......	A	......	A	......	A	......	A

FORTYMILE RIVER AT STEEL CREEK.

This gaging station was located 100 yards above the mouth of Steel Creek, at the Steel Creek road house, was established June 28, 1910, and has been maintained three seasons. All discharge measurements were made from a boat, in most of them only surface velocities being taken. The control is permanent and the rating should be very accurate. (See fig. 4, p. 55.) On May 19, 1911, the gage was taken out by high water, necessitating interpolation of discharges to May 23, when a new gage was installed.

The maximum stage for the period was recorded May 19, 1911, and indicated a discharge of approximately 37,000 second-feet. The minimum discharge of 420 second-feet occurred August 10, 1910. These values are probably close to the true maximum and minimum for the summer season at this point.

Discharge measurements of Fortymile River at Steel Creek, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
June 29	7.60	15,900	July 27	0.85	998
30	6.35	11,500	Sept. 3	.90	1,010
July 31	.10	*a* 575			
Aug. 16	1.10	*a* 1,340	1912.		
			June 3	7.73	15,000
1911.			July 3	2.60	2,990
May 23	4.52	6,620	Aug. 5	1.68	1,850
June 7	6.46	11,500			
July 8	3.37	4,170			

a Velocities taken at 0.6 depth.

Daily gage height, in feet, and discharge, in second-feet, of Fortymile River at Steel Creek for 1910–1912.

[Drainage area, 5,890 square miles. Observers: T. E. Phillips, 1910; J. C. Kemp, 1911–12.]

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.												
1					5.3	8,480	0.10	570	0.60	860		
2					4.2	5,840	.10	570	.60	860		
3					3.35	4,130	.10	570	.60	860		
4					2.45	2,750	.10	570	1.00	1,180		
5					2.00	2,200	0.0	520	1.20	1,360		
6					2.25	2,500	−.05	495	1.20	1,360		
7					1.85	2,020	−.10	470	1.30	1,460		
8					1.45	1,610	0.0	520	1.20	1,360		
9					1.05	1,220	5.0	7,740	1.05	1,220		
10					1.90	2,080	5.0	7,740	.90	1,100		
11					1.80	1,960	3.75	4 880	.90	1,100		
12					1.75	1,910	2.90	3,400	.90	1,100		
13					1.80	1,960	2.25	2,500	.85	1,060		
14					1.95	2,140	1.80	1,960	.80	1,020		
15					1.50	1,660	1.40	1,560	.80	1,020		
16					1.40	1,560	1.10	1,260	2.30	2,560		
17					1.25	1,410	1.05	1,220	2.55	2,890		
18					1.00	1,180	1.25	1,410	2.80	3,240		
19					.80	1,020	1.20	1,360	2.40	2,680		
20					.70	940	1.20	1,360	2.10	2,320		
21					.60	860	1.35	1,510	1.50	1,660		
22					.40	740	1.30	1,460		1,440		
23					.40	740	1.10	1,260	1.05	1,220		
24					.45	770	1.00	1,180				
25					.45	770	.95	1,140				
26					.60	860	1.05	1,220				
27					.50	800	1.00	1,180				
28			7.0	13,300	.35	710	1.00	1,180				
29			7.2	13,900	.30	680	.95	1,140				
30			6.4	11,500	.20	620	.95	1,140				
31					.10	570	.80	1,020				
Mean discharge				12,900		1,830		1,750		1,520		
Second-feet per square mile				2.19		0.311		0.297		0.258		
Run-off (depth in inches on drainage area)				0.24		0.36		0.34		0.22		
Maximum				13,900		8,480		7,740		3,240		
Minimum				11,500		570		470		860		
Accuracy				B		A		A		A		

Daily gage height, in feet, and discharge, in second-feet, of Fortymile River at Steel Creek for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.												
1			8.2	17,100	1.20	1,360	0.45	770	1.00	1,180		
2			6.5	11,800	1.20	1,360	.25	650	.90	1,100		
3			6.7	12,400	.95	1,140	.15	590	.80	1,020		
4			6.5	11,800	2.25	2,500	.10	570	.70	940		
5			6.2	11,000	2.80	3,240	.10	570		920		
6			7.2	13,900	4.7	7,020	.10	570		900		
7			6.2	11,000	4.3	6,060	+ .10	570		900		
8			5.1	7,980	3.40	4,220	− .05	495		880		
9			4.4	6,300	2.70	3,100	− .15	445	.60	860		
10			4.0	5,400	2.00	2,200	− .20	420	.55	830		
11			3.70	4,780	1.60	1,760	+ .05	545	.90	1,100		
12			3.10	3,720	1.40	1,560	.75	980	1.50	1,660		
13			3.80	4,980		1,310	1.35	1,510	2.15	2,380		
14			3.05	3,640	.85	1,060	.85	1,060	2.05	2,260		
15			3.10	3,720	1.50	1,660	.90	1,100	1.95	2,140		
16	4.5	6,540	4.0	5,400	4.10	5,620	1.40	1,560	1.75	1,910		
17	5.2	8,220	3.70	4,780	3.75	4,880	2.35	2,620	1.30	1,460		
18	7.1	13,600	3.75	4,880	2.15	2,380	2.00	2,200	.95	1,140		
19	12.6	33,400	3.35	4,130	1.90	2,080	1.90	2,080	.55	830		
20		31,000	2.75	3,170	1.60	1,760	1.75	1,910	.40	740		
21		15,000	2.30	2,560	1.10	1,260	1.40	1,560				
22		10,000	2.85	3,320	1.40	1,560	1.00	1,180				
23		6,000	1.75	1,910	1.60	1,760	.85	1,060				
24	4.2	5,840	1.60	1,760	1.50	1,660	.65	900				
25	5.1	7,980	1.55	1,710	.95	1,140	.50	800				
26	6.8	12,700	1.40	1,560	.90	1,100	.45	770				
27	6.6	12,100	1.25	1,410	.90	1,100	.35	710				
28	5.5	9,000	1.25	1,410	1.45	1,610	.30	680				
29	5.5	9,000	1.45	1,610	1.50	1,660	.30	680				
30	5.6	9,280	1.20	1,360	.95	1,140	.30	680				
31	8.2	17,100			.65	900		680				
Mean discharge		12,900		5,680		2,300		997		1,260		
Second-feet per square mile		2.19		0.965		0.390		0.169		0.214		
Run-off (depth in inches on drainage area)		1.30		1.08		0.45		0.19		0.16		
Maximum		33,400		17,100		7,020		2,620		2,380		
Minimum		5,840		1,360		900		420		740		
Accuracy		B		A		A		B		B		

Daily gage height, in feet, and discharge, in second-feet, of Fortymile River at Steel Creek for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1	......	......	4.9	7,500	2.80	3,240	1.15	1,310	2.10	2,320	1.65	1,810
2	......	......	5.2	8,220	2.35	2,620	1.80	1,960	2.15	2,380	1.70	1,860
3	......	......	8.0	16,400	2.75	3,170	2.10	2,320	2.10	2,320	1.60	1,760
4	......	......	6.8	12,700	2.90	3,400	2.00	2,200	2.00	2,200	1.45	1,610
5	2.90	3,400	5.8	9,840	2.40	2,680	1.70	1,860	2.05	2,260	1.35	1,510
6	3.10	3,720	4.8	7,260	2.00	2,200	1.55	1,710	2.05	2,260	1.30	1,460
7	3.45	4,310	4.0	5,400	1.55	1,710	4.7	7,020	2.00	2,200	1.30	1,460
8	4.1	5,620	3.30	4,040	1.25	1,410	6.6	12,100	1.95	2,140	1.20	1,360
9	4.5	6,540	2.95	3,480	1.10	1,260	3.20	3,880	1.80	1,960	1.10	1,260
10	5.0	7,740	3.10	3,720	.95	1,140	2.60	2,960	1.85	2,020	1.00	1,180
11	5.0	7,740	3.20	3,880	.90	1,100	4.2	5,840	2.25	2,500	.95	1,140
12	5.4	8,740	2.95	3,480	.95	1,140	8.9	19,500	2.20	2,440	.90	1,100
13	5.6	9,280	5.2	8,220	1.15	1,310	6.3	11,200	1.90	2,080	.80	1,002
14	6.3	11,200	6.6	12,100	1.15	1,310	3.85	5,080	1.80	1,960	.60	860
15	5.5	9,000	6.2	11,000	1.20	1,360	3.45	4,310	1.75	1,910	.60	860
16	5.4	8,740	9.6	22,000	1.25	1,410	2.90	3,400	1.80	1,960	.40	740
17	5.6	9,280	12.1	31,400	1.05	1,220	2.40	2,680	1.60	1,760	......	......
18	5.3	8,480	(a)	29,200	.85	1,060	2.40	2,680	2.70	3,100	......	......
19	4.8	7,260	(a)	22,600	.70	940	3.10	3,720	4.0	5,400	......	......
20	3.90	5,180	(a)	22,600	.65	900	3.10	3,720	3.95	5,290	......	......
21	3.90	5,180	(a)	18,000	.70	940	3.10	3,720	3.50	4,400	......	......
22	4.0	5,400	7.4	14,500	4.4	6,300	2.95	3,480	3.10	3,720	......	......
23	4.0	5,400	7.6	15,100	3.40	4,220	2.60	2,960	2.70	3,100	......	......
24	3.75	4,880	7.1	13,600	2.55	2,890	2.50	2,820	2.45	2,750	......	......
25	2.65	3,030	5.9	10,100	2.15	2,380	2.60	2,960	2.10	2,320	......	......
26	2.35	2,620	6.0	10,400	2.00	2,200	2.45	2,750	1.70	1,860	......	......
27	1.90	2,080	5.7	9,560	2.25	2,500	2.40	2,680	1.55	1,710	......	......
28	2.00	2,200	4.7	7,020	2.35	2,620	3.00	3,560	1.40	1,560	......	......
29	5.2	8,220	3.90	5,180	1.95	2,140	2.75	3,170	1.40	1,560	......	......
30	7.8	15,800	3.35	4,130	1.60	1,760	2.55	2,890	1.40	1,560	......	......
31	6.3	11,200	......	......	1.35	1,510	2.25	2,500	......	......	......	......
Mean discharge	......	6,750	......	11,800	......	2,070	......	4,290	......	2,500	......	1,310
Second-feet per square mile	......	1.15	......	2.00	......	0.351	......	0.728	......	0.424	......	0.222
Run-off (depth in inches on drainage area)	......	1.15	......	2.23	......	0.40	......	0.84	......	0.47	......	0.13
Maximum	......	15,800	......	31,400	......	6,300	......	19,500	......	5,400	......	1,860
Minimum	......	2,080	......	3,480	......	900	......	1,310	......	1,560	......	740
Accuracy	......	A	......	B	......	A	......	A	......	A	......	A

a Discharge for the period June 18–21 was estimated by comparison with discharge at station on South Fork.

MOSQUITO FORK AT KECHUMSTUK.

Records have been obtained on Mosquito Fork 100 yards below the mouth of Kechumstuk Creek and about 26 miles west of Chicken post office for portions of three seasons at a station established July 7, 1910. The control has remained permanent for low stages, but at high stages it has probably been changed somewhat by repairs on a diversion dam one-fourth mile below the gage. Measurements were made by wading and from a raft. The records are thought to be very accurate. The maximum discharge of 4,030 and the minimum of 34 second-feet occurred on June 16, 1912, and September 30, 1910, respectively.

A project has been proposed for diverting water from Mosquito Fork at Kechumstuk and carrying it by ditch to Chicken for use in hydraulic mining. The stream falls rapidly below Kechumstuk and, if ever the market should warrant, power might be developed by a ditch diverting it to a lower point in the valley, where the fall could be concentrated. The records at Kechumstuk should be of value in the consideration of these projects.

Discharge measurements of Mosquito Fork at Kechumstuk, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
July 7	1.24	318	June 9	1.40	[a] 396
8	.99	273	July 11	.42	141
Aug. 5	−.21	42	Aug. 14	1.53	[a] 479
6	−.22	41	14	1.53	[b] 492
12	.60	182			
13	.46	140			
1911.					
Aug. 25	.11	89			

[a] Measurement by surface velocities; coefficient, 101.6 per cent.
[b] Velocities at 0.6 depth; coefficient, 90 per cent.

Daily gage height, in feet, and discharge, in second-feet, of Mosquito Fork at Kechumstuk Creek for 1910–1912.

[Drainage area, 824 square miles. Observer, Henry Siemer.]

Day.	July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			−0.10	56	0.00	70	−0.15	50
2			−.15	50	.00	70	−.20	44
3			−.15	50	−.50	63	−.25	39
4			−.20	44	−.10	56		
5			−.20	44	−.10	56		
6			−.20	44	−.05	63		
7	1.25	339	−.25	39	−.05	63		
8	1.10	296	−.20	44	−.10	56		
9	.85	232	+.85	232	−.10	56		
10	.70	198	.70	198	−.10	56		
11	.60	174	.60	174	−.10	56		
12	.60	174	.65	185	−.10	56		
13	.70	198	.50	152	−.10	56		
14	.70	198	.40	132	−.10	56		
15	.70	198	.25	108	−.05	63		
16	.90	244	.15	92	.00	70		
17	.70	198	.10	84	+.05	77		
18	.55	163	.10	84	.10	84		
19	.45	142	.05	77	.10	84		
20	.35	124	.10	84	.05	77		
21	.25	108	.10	84	.00	70		
22	.20	100	.30	116	−.05	63		
23	.20	100	.25	108	−.15	50		
24	.15	92	.20	100	−.10	56		
25	.10	84	.20	100	−.10	56		
26	.10	84	.15	92	−.15	50		
27	.10	84	.10	84	−.15	50		
28	.10	84	.05	77	−.15	50		
29	.05	77	.00	70	−.25	39		
30	.00	70	.00	70	−.30	34		
31	−.05	63	.00	70				
Mean discharge		153		95.0		60.2		44.3
Second-feet per square mile		0.186		0.115		0.073		0.054
Run-off (depth in inches on drainage area)		0.17		0.13		0.08		0.006
Maximum		339		232		84		50
Minimum		63		39		34		39
Accuracy		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Mosquito Fork at Kechumstuk Creek for 1910–1912—Continued.

Day.	August.		September.		October.		Day.	August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.							1911.						
1	......	......	−0.03	66	0.65	185	21	0.85	232	0.50	152	......	......
2	......	......	− .04	64	.60	174	22	.80	220	.40	132	......	......
3	......	......	− .04	64	.50	152	23	.80	220	.35	124	......	......
4	......	......	− .04	64	.45	142	24	.75	209	.30	116	......	......
5	......	......	− .04	64	.40	132	25	.75	209	.11	86	......	......
6	......	......	− .05	63	.04	76	26	.70	198	.04	76	......	......
7	......	......	− .05	63	.04	76	27	.90	244	.00	70	......	......
8	......	......	− .05	63	− .04	64	28	.85	232	− .02	67	......	......
9	......	......	− .02	67	− .10	56	29	.85	232	− .02	67	......	......
10	......	......	+ .02	73	+ .07	80	30	.80	220	− .02	67	......	......
							31	......	......	− .03	66	......	......
11	......	......	.40	132	− .01	69							
12	......	......	.95	257	− .07	60	Mean discharge	......	99.8	......	17.2	......	95.2
13	......	......	.75	209	− .13	52							
14	......	......	.95	257	− .11	55							
15	......	......	.90	244	− .11	55	Second-feet per square mile	......	0.121	......	0.209	......	0.116
16	......	......	.90	241	......	......							
17	......	......	.90	244	......	......							
18	......	......	.85	232	......	......							
19	......	......	.85	232	......	......							
20	0.60	174	.85	232	......	......	Run-off (depth in inches on drainage area)	......	0.05	......	0.23	......	0.06
							Maximum	......	174	......	257	......	185
							Minimum	......	66	......	63	......	52
							Accuracy	......	B	......	C	......	B

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1	....	....	1.75	660	0.20	100	1.30	356
2	....	....	1.50	460	....	100	1.35	378
3	....	....	1.20	322	....	100	1.35	378
4	....	....	.95	257	....	92	1.40	400
5	....	....	.85	232	....	92	....	400
6	....	....	.50	152	.10	84	....	400
7	....	....	.50	152	....	100	1.40	400
8	....	....	.40	132	....	100	1.40	400
9	1.40	400	.40	132	....	100	1.50	460
10	1.30	356	.30	116	....	400	1.50	460
11	1.20	322	.40	132	....	1,000	1.40	400
12	1.60	540	.40	132	1.70	620	1.50	460
13	2.20	1,020	.40	132	1.60	540	1.50	460
14	2.9	1,610	.60	174	1.50	460	1.50	460
15	2.40	1,180	.65	185	1.35	378	1.50	460
16	5.3	4,030	.50	152	1.10	296	1.50	460
17	5.1	3,790	.40	132	.70	198	1.50	460
18	4.4	3,020	.70	198	.90	244	1.50	460
19	4.5	3,120	.80	220	.90	244	1.40	400
20	4.1	2,720	1.00	270	1.00	270	1.30	356
21	4.1	2,720	1.00	270	1.10	296	1.10	296
22	3.8	2,420	1.00	270	1.10	296	1.90	780
23	3.9	2,520	1.00	270	1.20	322	1.80	700
24	3.8	2,420	1.10	296	1.25	339	1.75	660
25	3.7	2,330	.90	244	1.20	322	1.60	540
26	3.8	2,420	.90	244	1.10	296	1.60	540
27	3.0	1,700	.55	163	1.10	296	1.50	460
28	2.6	1,340	.40	132	1.20	322	1.50	460
29	2.20	1,020	.20	100	1.25	339	1.50	460
30	1.95	820	.05	77	1.25	339	1.50	460
31			.15	92	1.30	356	....	....
Mean discharge	....	1,900	....	210	....	292	....	459
Second-feet per square mile	....	2.31	....	0.255	....	0.354	....	0.557
Run-off (depth in inches on drainage area)	....	1.89	....	0.29	....	0.41	....	0.62
Maximum	....	4,030	....	660	....	1,000	....	780
Minimum	....	322	....	77	....	84	....	296
Accuracy	....	B	....	A	....	B	....	A

KECHUMSTUK CREEK AT MOUTH.

This station is located one-fourth mile above the mouth of Kechumstuk Creek, 2 miles below Kechumstuk Indian village and about 26 miles west of Chicken post office. Records were started July 7, 1910. The same location has been used for three seasons, but a change in rating occurred between the seasons of 1910 and 1911, so that two ratings have been used, one for 1910 and one for 1911 and 1912. All discharge measurements were made by wading.

The records show that Kechumstuk Creek rises more abruptly and subsides more quickly than Mosquito Fork above Kechumstuk Creek. This peculiarity is accounted for by the marked difference in topography of the two areas. Kechumstuk Creek lies largely in a rugged mountainous area, which affords little storage and spills quickly, whereas the flat swampy basin of the upper Mosquito Fork furnishes a very efficient reservoir.

Discharge measurements of Kechumstuk Creek at mouth, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
July 7	1.89	71	Aug. 25	1.31	17.8
8	1.86	64			
Aug. 5	1.35	12.2	1912.		
6	1.33	10.4	June 9	1.96	92
12	1.80	53	July 11	1.50	28
13	1.74	38	Aug. 13	2.70	317
14	1.66	31	14	2.50	256

Daily gage height, in feet, and discharge, in second-feet, of Kechumstuk Creek at mouth for 1910–1912.

[Drainage area, 189 square miles. Observer, Henry Siemer.]

Day.	July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			1.40	13.0	1.44	14.8	1.44	14.8
2			1.40	13.0	1.44	14.8	1.40	13.0
3			1.39	12.7	1.42	13.9	1.36	11.8
4			1.38	12.4	1.41	13.5		
5			1.36	11.8	1.46	15.8		
6			1.34	11.1	1.49	17.1		
7	1.93	80	1.32	10.5	1.50	17.6		
8	1.88	69	1.39	12.7	1.50	17.6		
9	1.80	52	2.31	178	1.48	16.7		
10	1.74	42	2.14	132	1.48	16.7		
11	1.72	39	1.96	87	1.46	15.8		
12	1.66	32	1.78	49	1.46	15.8		
13	2.00	97	1.72	39	1.44	14.8		
14	1.98	92	1.66	32	1.46	15.8		
15	1.86	65	1.59	24	1.51	18.3		
16	1.78	49	1.55	21	1.60	25		
17	1.72	39	1.58	24	1.65	30		
18	1.66	32	1.58	24	1.67	33		
19	1.61	26	1.56	22	1.66	32		
20	1.58	24	1.58	24	1.60	25		
21	1.56	22	1.58	24	1.56	22		
22	1.58	24	1.56	22	1.48	16.7		
23	1.59	24	1.50	17.6	1.48	16.7		
24	1.58	24	1.49	17.1	1.48	16.7		
25	1.56	22	1.49	17.1	1.48	16.7		
26	1.52	19.1	1.48	16.7	1.46	15.8		
27	1.49	17.1	1.46	15.8	1.44	14.8		
28	1.46	15.8	1.44	14.8	1.44	14.8		
29	1.44	14.8	1.46	15.8	1.36	11.8		
30	1.42	13.9	1.44	14.8	1.38	12.4		
31	1.40	13.0	1.44	14.8				
Mean discharge		37.9		30.4		18.1		13.2
Second-feet per square mile		0.201		0.161		0.096		0.070
Run-off (depth in inches on drainage area)		0.19		0.18		0.11		0.008
Maximum		97		178		33		14.8
Minimum		13.0		10.5		11.8		11.8
Accuracy		A		A		A		A

Day.	August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.						
1			1.28	15	1.42	21
2			1.27	15	1.40	20
3			1.24	14	1.48	26
4			1.24	14	1.49	26
5			1.27	15	1.48	26
6			1.26	14	1.46	24
7			1.26	14	1.41	21
8			1.25	14	1.49	26
9			1.24	14	1.41	21
10			1.26	14	1.50	27
11			1.29	16	1.48	26
12			1.82	67	1.46	24
13			2.12	136	1.38	19
14			2.13	139	1.39	20
15			2.00	102	1.38	19
16			1.98	98	1.30	16
17			1.92	84		
18			1.86	74		
19			1.84	70		
20	1.46	24	1.82	67		
21	1.42	21	1.80	64		
22	1.39	20	1.78	61		
23	1.36	18	1.76	58		
24	1.34	18	1.71	51		
25	1.33	17	1.69	49		
26	1.32	17	1.68	47		
27	1.30	16	1.63	41		
28	1.30	16	1.63	41		
29	1.29	16	1.60	37		
30	1.28	15	1.53	30		
31	1.28	15	1.46	24		
Mean discharge		17.5		48.4		22.6
Second-feet per square mile		0.093		0.256		0.120
Run-off (depth in inches on drainage area)		0.04		0.295		0.07
Maximum		24		139		27
Minimum		15		14		16
Accuracy		B		C		C

Daily gage height, in feet, and discharge, in second-feet, of Kechumstuk Creek at mouth for 1910–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1			1.92	84	1.50	27	2.00	102
2			1.85	72		27	2.00	102
3			1.90	80		27	2.00	102
4			1.85	72		27	2.00	102
5			1.88	77		27		102
6			1.78	61	1.50	27		102
7			1.65	44		40	2.00	102
8			1.45	24		40	2.00	102
9	1.95	91	1.30	16		40	1.90	80
10	1.96	93	1.30	16		240	2.10	130
11	1.92	84	1.50	27		600	2.00	102
12	2.60	284	1.45	24	3.00	420	1.90	80
13	3.2	492	1.45	24	2.75	335	1.90	80
14	3.9	778	1.42	21	2.45	236	1.90	80
15	3.2	492	1.30	16	2.35	205	1.90	80
16	6.8	2,200	1.30	16	2.05	116	1.90	80
17	5.4	1,450	1.30	16	2.00	102	1.90	80
18	3.7	694	1.10	8	2.35	205	1.90	80
19	4.3	946	1.10	8	2.32	196	2.00	102
20	3.4	568	1.10	8	2.25	175	2.10	130
21	3.00	420	1.10	8	2.15	145	2.10	130
22	3.00	420	1.20	12	2.05	116	2.50	252
23	3.8	736	1.30	16	2.20	160	1.86	74
24	3.00	420	1.45	24	2.25	175	1.92	84
25	2.75	335	1.50	27	2.10	130	1.82	67
26	2.60	284	1.52	29	2.20	160	1.80	64
27	2.55	278	1.52	29	2.10	130	1.80	64
28	2.38	214	1.49	26	2.00	102	1.79	63
29	2.15	145	1.44	23	2.00	102	1.78	61
30	2.05	116	1.40	20	2.00	102	1.77	60
31			1.47	25	2.00	102		
Mean discharge		525		30.7		146		94.6
Second-feet per square mile		2.78		0.162		0.772		0.500
Run-off (depth in inches on drainage area)		2.27		0.19		0.89		0.56
Maximum		2,200		84		600		252
Minimum		84		8		27		60
Accuracy		B		A		A		A

GOLD CREEK AT MOUTH.

Scattered records were obtained on Gold Creek during 1911. The gage was located at the mouth, near a small plant constructed for prospecting gold-bearing quartz. The topography of the Gold Creek basin is very similar to that of Kechumstuk Creek, and it is believed the peculiarities of its run-off are very much the same.

Discharge measurements of Gold Creek at mouth, 1910–11.

Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*
Aug. 12		21.0
1911.		
May 29	2.60	52.6
July 18	2.30	16.5
Aug. 24	2.22	11.7

Daily gage height, in feet, and discharge, in second-feet, of Gold Creek at mouth for 1911.

[Drainage area, 115 square miles. Observer, Ole Tweeden.]

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.90	328				
2			3.45	216				
3			3.35	195				
4			3.20	160				
5			3.45	216				
6			3.45	216				
7			3.10	140				
8			2.90	110				
9								
10								
11								
12								
13								
14								
15								
16								
17								
18					2.30	17.0		
19								
20								
21								
22								
23								
24							2.20	10.2
25								
26								
27								
28	2.75	80						
29	2.65	62						
30	4.25	435						
31	4.55	510						

WALKER FORK ABOVE POKER CREEK.

A station was maintained on Walker Fork just above Poker Creek for a short period during 1912. The tributary area is small and is almost entirely in Canadian territory. The records are of value for supplementing those obtained at lower points on the stream during 1910 and 1911 but which could not be continued during 1912 because of lack of observers.

Discharge measurements of Walker Fork above Poker Creek, 1910 and 1912.

Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*
July 2		5.7
1912.		
Aug. 8	2.62	11.4
9	2.59	9.81
22	2.45	5.32

Daily gage height, in feet, and discharge, in second-feet, of Walker Fork above Poker Creek for 1912.

[Drainage area, 7.37 square miles. Observer, J. C. Brown.]

Day	July.		August.		September.		Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1					2.30	2.6	21			2.50	7.0		
2					2.30	2.6	22			2.45	5.6		
3					2.35	3.4	23			2.45	5.6		
4					2.30	2.6	24			2.45	5.6		
5					2.40	4.2	25			2.40	4.2		
6		4.8					26			2.40	4.2		
7							27			2.40	4.2		
8			2.60	10			28			2.40	4.2		
9			2.60	10			29			2.40	4.2		
10			2.60	10			30			2.40	4.2		
11			2.80	20			31			2.35	3.4		
12			2.90	25			Mean discharge				8.50		3.08
13			2.70	15			Second-feet per square mile				1.15		0.417
14			2.70	15			Run-off (depth in inches on drainage area)				1.03		0.08
15			2.60	10			Maximum				25		4.2
16			2.60	10			Minimum				3.4		2.6
17			2.50	7.0			Accuracy				A		A
18			2.50	7.0									
19			2.50	7.0									
20			2.45	5.6									

WALKER FORK ABOVE CHERRY CREEK.

This station was located on Walker Fork about a mile above the mouth of Cherry Creek. It was established June 5, 1911. Records were obtained the greater part of the season of 1911 and scattering records in 1912. The daily discharge may occasionally have been somewhat affected by storage for a dredge which was operated above the station. At times during 1911 there was barely enough water for floating. This may have been due partly to the porous character of the gravel and partly to the dam not being sufficiently tight, for dredges have probably been operated very successfully with a much smaller water supply.

Discharge measurements of Walker Fork above Cherry Creek, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 5	2.70	34.1	June 5	2.58	16.8
July 24	2.05	2.67	July 6	2.38	6.14
Aug. 30	2.25	8.40	Aug. 8		[a] 23.1

[a] Gage washed out.

Daily gage height, in feet, and discharge, in second-feet, of Walker Fork above Cherry Creek, for 1911–12.

[Drainage area, 15.8 square miles. Observer, James Campbell, 1911.]

Day.	June.		July.		August.		Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.							1911—Con.						
1			2.30	13.9	2.15	5.2	21	2.45	16.3	2.05	2.5	2.38	13.1
2			2.30	13.9	2.12	4.3	22	2.45	16.3	2.05	2.5	2.28	9.3
3			2.45	16.3	2.08	3.3	23	2.50	18.8	2.02	1.8	2.25	8.3
4			2.60	25	2.20	6.5	24	2.40	13.9	2.05	2.5	2.25	8.3
5	2.80	46	2.45	16.3	2.15	5.2	25	2.40	13.9	2.00	1.3	2.20	6.5
6	3.00	69	2.35	12.0	2.10	3.8	26	2.45	16.3	2.12	4.3	2.20	6.5
7	2.90	57	2.25	8.3	2.10	3.8	27	2.45	16.3	2.35	12.0	2.20	6.5
8		60	2.30	10.0	2.10	3.8	28	2.45	16.3	2.38	13.1	2.30	10.0
9		65	2.15	5.2	2.10	3.8	29	2.30	10.0	2.30	10.0		12.0
10		70	2.20	6.5	2.12	4.3	30	2.35	12.0	2.28	9.3		12.0
11		70	2.25	8.3	3.08	79	31			2.18	8.7		14.0
12		65	2.10	3.8	2.75	40							
13		75	2.10	3.8	2.60	25	Mean discharge		37.8		7.8		15.3
14		70	2.25	8.3	2.58	24							
15		60	2.25	8.3	2.60	25							
16		50	2.15	5.2	2.75	40	Second-feet per square mile		2.39		0.494		0.968
17		20	2.10	3.8	2.70	34							
18		20	2.05	2.5	2.60	25							
19		20	2.05	2.5	2.50	18.8							
20	2.45	16.3	2.00	1.3	2.40	13.9	Run-off (depth in inches on drainage area)		2.31		0.570		1.12
							Maximum		75		25		79
							Minimum		10		1.3		3.3
							Accuracy		C		A		B

Day.	June.		July.		August.		Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.							1912—Con.						
1							16						
2							17						
3							18						
4							19						
5	2.60	25					20						
6			2.40	8			21						
7							22						
8						23	23						
9							24						
10	2.55	20					25						
11							26						
12	2.50	16					27						
13							28						
14							29						
15							30						
							31						

WALKER FORK ABOVE TWELVEMILE CREEK.

A gaging station was established on Walker Fork, 1½ miles above Twelvemile Creek, on July 3, 1910, and gage-height records were obtained for about two months. The station could not be maintained in 1911 or 1912 because no observers were available. The record is of value as showing the characteristics of run-off of a typical Alaskan stream.

Discharge measurements of Walker Fork above Twelvemile Creek, 1910.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
July 3	2.28	33
4	2.25	30
Aug. 2	2.00	15
18	2.25	29
19	2.33	35

Daily gage height, in feet, and discharge, in second-feet, of Walker Fork above Twelvemile Creek for 1910.

[Drainage area, 70.2 square miles. Observer, J. T. Dickinson.]

Day.	July.		August.		Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1			2.25	30	21	2.10	20		26
2			2.00	15.0	22	2.25	30	2.20	26
3	2.30	33	1.90	11.3	23	2.30	33	2.25	30
4	2.25	30	1.90	11.3	24	2.35	37	2.25	30
5	2.22	27	1.85	10.0	25	2.20	26	2.20	26
6	2.50	51	1.80	8.7	26	2.10	20	2.20	26
7	2.35	37		10	27	2.00	15.0		
8	2.20	26		54	28	1.95	13.2		
9	2.15	23	3.80	242	29	2.20	26		
10		26	3.00	114	30	2.25	30		
11	2.25	30	2.60	61	31	2.25	30		
12	2.20	26	2.40	41					
13	2.45	46	2.30	33	Mean discharge		28.4		38.0
14	2.30	33		26					
15	2.40	41	2.10	20	Second-feet per square mile		0.405		0.541
16	2.20	26		25					
17	2.15	23	2.25	30	Run-off (depth in inches on drainage area)		0.44		0.52
18	2.15	23	2.25	30	Maximum		51		242
19	2.20	26	2.20	26	Minimum		13.2		8.7
20	2.00	15.0	2.20	26	Accuracy		A		B

WADE CREEK AT CLAIM "NO. 10 ABOVE."

This station is located about 8 miles above the mouth of Wade Creek, one-half mile above Jack Wade post office, at claim "No. 10 above." It was established July 4, 1910, and maintained for three seasons, the gage being relocated in 1911. It was impossible to determine by measurements the high-water rating, but it is believed that the rating determined by the curve extensions is fairly accurate.

Wade Creek has been an important gold producer in the Fortymile district. Ordinary open-cut and drifting methods have been used, and a number of ditches have been constructed for bringing the water to the claims at a suitable elevation for working. Frequently during the summer the water supply has been inadequate for continuous mining. Especially was this true in 1911, when mining operations were at a standstill for most of the season because of the very small flow.

Discharge measurements of Wade Creek at claim "No. 10 above," 1910-1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
July 4	1.54	2.3	Aug. 29	1.70	2.5
Aug. 2	1.42	0.91	1912.		
19	2.24	19	June 6	2.06	11.3
20	2.07	13	July 6	1.67	.87
1911.			Aug. 10	2.19	15.2
June 3	2.33	24.8	21	2.06	11.4
July 21	1.67	2.1			

Daily gage height, in feet, and discharge, in second-feet, of Wade Creek at claim "No. 10 above" for 1910-1912.

[Drainage area, 23.1 square miles. Observer, J. P. Carroll.]

Day.	July.[a]		August.		September.		Day.	July.[a]		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.							1910—Con.						
1				2.0	2.00	11.0	21		4.0	2.08	13.4	2.00	11.0
2			1.42	1.1	2.08	13.4	22		6.5	2.17	16.4	2.00	11.0
3			1.42	1.1	2.08	13.4	23		9.0	1.92	8.8	2.08	13.4
4	1.54	2.1	1.42	1.1	2.08	13.4	24		7.0	2.08	13.4	2.00	11.0
5		5.5	1.50	1.7	2.04	12.2	25		5.2	2.67	40	1.92	8.8
6	1.92	8.8	1.42	1.1	2.17	16.4	26		3.5	2.33	23	2.17	16.4
7		7.4	1.50	1.7	2.08	13.4	27	1.50	1.7	2.42	27	2.08	13.4
8		6.0	2.50	31	2.00	11.0	28		2.5	2.33	23	2.08	13.4
9		4.5	4.08	125	2.00	11.0	29		3.2	2.08	13.4	1.92	8.8
10		3.0	3.50	90	2.08	13.4	30		4.0	2.08	13.4	1.92	8.8
11		6.5	2.00	11.0	2.08	13.4	31		3.0	2.00	11.0		
12		10.0	2.17	16.4	2.04	12.2	Mean discharge		6.11		20.0		13.1
13		13.0	2.00	11.0	2.00	11.0	Second-feet per square mile		0.264		0.866		0.567
14	2.17	16.4	2.04	12.2	2.17	16.4	Run-off (depth in inches on drainage area)		0.27		1.00		0.63
15		5.0	1.92	8.8	2.17	16.4	Maximum		16.4		125		19.5
16		10.0	2.42	27	2.08	13.4	Minimum		1.5		1.1		8.8
17		7.5	2.33	23	2.25	19.5	Accuracy		C		B		A
18		9.0	2.25	19.5	2.17	16.4							
19		5.2	2.25	19.5	2.17	16.4							
20		1.5	2.08	13.4	2.08	13.4							

[a] Daily discharges for the greater portion of July are estimated by comparative hydrographs and are only approximate.

Daily gage height, in feet, and discharge, in second-feet, of Wade Creek at claim "No. 10 above" for 1910–1912—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1			1.67	2.3	1.67	2.3	1.84	5.2	2.08	12.1
2			1.67	2.3	1.67	2.3	1.84	5.2	2.17	15.7
3	2.25	19.8	1.67	2.3	1.67	2.3	1.84	5.2	2.08	12.1
4	2.42	30	1.67	2.3	1.75	3.5	1.84	5.2	2.00	9.5
5	3.25	79	1.84	5.2	1.75	3.5	1.75	3.5	2.00	9.5
6	2.58	39	2.08	12.1	1.67	2.3	1.75	3.5	1.84	5.2
7	2.42	30	1.84	5.2	1.67	2.3	1.67	2.3	1.92	7.1
8	2.25	19.8	1.75	3.5	1.58	1.3	1.67	2.3	1.84	5.2
9	2.17	15.7	1.71	2.9	1.58	1.3	1.67	2.3	1.75	3.5
10	2.25	19.8	1.75	3.5	1.50	.6	1.75	3.5	1.75	3.5
11	2.17	15.7	1.84	5.2	1.84	5.2	1.75	3.5	1.75	3.5
12	2.17	15.7	1.79	4.2	1.84	5.2	2.25	19.8	1.67	2.3
13	2.17	15.7	1.75	3.5	1.84	5.2	2.33	24	1.67	2.3
14	2.08	12.1	1.71	2.9	1.92	7.1	2.17	15.7	1.67	2.3
15	2.08	12.1	2.75	3.5	1.84	5.2	2.17	15.7	1.67	2.3
16	2.00	9.5	1.92	7.1	1.92	7.1	2.17	15.7	1.67	2.3
17	2.00	9.5	1.84	5.2	1.92	7.1	2.00	9.5	1.75	3.5
18	2.00	9.5	1.75	3.5	1.84	5.2	1.75	3.5	1.75	3.5
19	2.92	7.1	1.67	2.3	1.84	5.2	1.75	3.5		
20	2.92	7.1	1.67	2.3	1.75	3.5	1.75	3.5		
21	1.84	5.2	1.67	2.3	1.75	3.5	1.84	5.2		
22	1.88	6.1	1.67	2.3	1.67	2.3	1.84	5.2		
23	1.84	5.2	1.67	2.3	1.67	2.3	1.84	5.2		
24	1.75	3.5	1.84	5.2	1.67	2.3	1.92	7.1		
25	1.67	2.3	1.75	3.5	1.67	2.3	1.92	7.1		
26	1.50	.6	1.84	5.2	1.67	2.3	2.00	9.5		
27	1.67	2.3	1.92	7.1	1.75	3.5	2.67	45		
28	1.75	3.5	1.75	3.5	1.67	2.3	2.17	15.7		
29	1.67	2.3	1.75	3.5	1.67	2.3	2.17	15.7		
30	1.67	2.3	1.67	2.3	1.84	5.2	2.08	12.1		
31			1.67	2.3	1.84	5.2				
Mean discharge		14.3		3.9		3.6		9.3		5.8
Second-feet per square mile		0.619		0.169		0.156		0.403		0.251
Run-off (depth in inches on drainage area)		0.64		0.19		0.18		0.45		0.17
Maximum		79		12.1		7.1		45		15.7
Minimum		0.6		2.3		0.6		2.3		2.3
Accuracy		B		B		C		B		B

Daily gage height, in feet, and discharge, in second-feet, of Wade Creek at claim "No. 10 above" for 1910-1912—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge,	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1	....	....	1.67	1.0	2.17	15	2.04	10	2.42	25
2	....	....	1.58	.8	2.67	38	2.00	9.3	2.42	25
3	....	....	1.50	.8	2.00	9.3	2.00	9.3	2.33	21
4	....	....	1.42	.8	2.00	9.3	2.00	9.3	2.33	21
5	....	....	1.33	.8	1.92	6.9	2.00	9.3	2.25	18
6	2.04	10	1.67	1.0	2.33	21	2.00	9.3	2.25	18
7	2.04	10	1.67	1.0	2.65	36	2.17	15	2.17	15
8	2.00	9.3	1.67	1.0	2.65	36	2.17	15	2.33	21
9	2.00	9.3	1.67	1.0	2.08	12	2.08	12	2.33	21
10	2.00	9.3	1.58	.4	2.17	15	2.17	15	2.29	20
11	1.83	4.2	1.67	1.0	3.15	68	2.08	12	2.29	20
12	1.75	2.3	1.67	1.0	3.50	96	2.08	12	....	....
13	2.33	21	1.67	1.0	3.35	84	2.08	12	....	....
14	2.25	18	1.75	2.3	3.35	84	2.08	12	....	....
15	2.33	21	1.75	2.3	2.65	36	2.08	12	....	....
16	2.83	47	1.83	4.2	2.33	21	2.00	9.3	....	....
17	2.33	21	1.83	4.2	2.25	18	2.50	29	....	....
18	2.25	18	1.83	4.2	2.17	15	3.50	96	....	....
19	2.33	21	1.67	1.0	2.25	18	2.65	36	....	....
20	2.33	21	1.67	1.0	2.17	15	2.85	48	....	....
21	2.25	18	1.75	2.3	2.25	18	2.50	29	....	....
22	2.17	15	2.65	36	2.08	12	2.50	29	....	....
23	2.33	21	2.60	34	2.04	10	2.50	29	....	....
24	2.42	25	2.33	21	2.04	10	2.42	25	....	....
25	2.33	21	2.17	15	2.00	9.3	2.25	18	....	....
26	2.25	18	2.00	9.3	2.04	10	2.25	18	....	....
27	2.00	9.3	2.00	9.3	2.17	15	2.17	15	....	....
28	2.00	9.3	1.92	6.9	2.21	16	2.17	15	....	....
29	1.75	2.3	1.92	6.9	2.17	15	2.12	13	....	....
30	1.75	2.3	1.83	4.2	2.17	15	2.50	29	....	....
31	....	....	1.83	4.2	2.17	15	....	....	....	....
Mean discharge	....	15.3	....	5.8	....	25.7	....	20.4	....	20.5
Second-feet per square mile	....	0.662	....	0.251	....	1.11	....	0.883	....	0.887
Run-off (depth in inches on drainage area)	....	0.62	....	0.29	....	1.28	....	0.99	....	0.36
Maximum	....	47	....	36	....	96	....	96	....	25
Minimum	....	2.3	....	0.4	....	6.9	....	9.3	....	15
Accuracy	....	B	....	B	....	B	....	B	....	B

BUCKSKIN CREEK ABOVE FORTYFIVE PUP.

Scattered gage-height records were obtained on Buckskin Creek just above the mouth of Fortyfive Pup during 1910, 1911, and 1912. The basin of Buckskin Creek above Fortyfive Pup is similar to that of Fortyfive Pup, and the characteristics of its flow are probably the same. The records for Fortyfive Pup are more continuous and may be found below:

Discharge measurements of Buckskin Creek above Fortyfive Pup, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
1910.			1912.		
July 11	0.50	4.3	June 12	0.79	[a] 13.6
Aug. 11	.86	12.7	July 15	.46	3.0
21	.58	5.2	Aug. 17	1.00	24.0
1911.			20	.92	20.9
June 2	1.36	45.9			
July 10	.50	6.0			
15	.79	14.4			
Aug. 21	.46	5.2			

[a] Measurement made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Buckskin Creek above Fortyfive Pup for 1910–1912.

[Drainage area, 33 square miles. Observer, L. G. Michaels.]

Day.	July.		August.		September.		Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.							1910—Con.						
1					0.58	5.3	16						
2							17						
3							18						
4			0.38	3.3	.50	4.3	19						
5			.33	2.9	.46	3.9	20						
6							21			0.50	4.3		
7							22						
8							23						
9							24						
10							25						
11	0.50	4.3	.85	12.4			26						
12							27						
13	.54	4.8			.46	3.9	28						
14	.50	4.3					29						
15							30						
							31						

Daily gage height, in feet, and discharge, in second-feet, of Buckskin Creek above Fortyfive Pup for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1										
2			1.29	42.2						
3										
4					0.50	5.9	0.46	4.7		
5					.50	5.9	.42	3.4		
6										
7										
8										
9										
10										
11					.92	23.0				
12					.50	5.9				
13			.67	11.8	.50	5.9				
14			.67	11.8						
15	1.58	61.0			.79	16.7				
16										
17										
18										
19										
20										
21							.46	4.7		
22										
23					.33	.9	.33	.90		
24					.33	.9	.33	.90		
25			.50	5.9						
26										
27										
28										
29									0.62	9.9
30										
31										

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1								
2			0.60	6.6				
3								
4			.55	5.2	0.85	17		
5			.50	3.8	.75	13		
6								
7								
8								
9								
10								
11								
12	0.90	19						
13							0.90	19
14								
15			.45	2.9				
16								
17					1.00	24		
18								
19								
20					.90	19		
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								

FORTYFIVE PUP AT CLAIM NO. 13.

This station is located at claim No. 13, about 3 miles above the mouth of Fortyfive Pup and 16 miles west of Franklin post office. It was established on July 11, 1910, and remained in its first location through 1911. In 1912 it was reestablished at the edge of claim No. 14, about one-fourth mile above its original position. The change would have no appreciable effect on the quantity of flow. The creek heads in high slide-rock mountains, and the snow and ice remain in the sheltered gulches well into the summer, furnishing a very dependable source of stream flow until they have melted away. The seasons of 1911 and 1912 probably furnish very good examples of abnormal water supply on this stream, 1911 being very dry and 1912 very wet.

Discharge measurements of Fortyfive Pup at claim No. 13, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
July 11	1.60	1.4	July 15	1.67	3.1
12	1.68	2.4	Aug. 22	1.62	2.2
Aug. 10	2.12	16.4			
11	2.00	10.3	1912.		
21	1.67	2.1	June 12	2.67	a 15.1
			July 15	2.12	2.1
1911.			Aug. 17	2.33	9.5
June 2	1.92	12.5	19	2.27	6.6
July 12	1.52	1.2			

a Measurement made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Fortyfive Pup at claim No. 13 for 1910–1912.

[Drainage area, 9.1 square miles. Observer, L. G. Michaels.]

Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.	Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.
1910.							1910—Con.						
1			1.46	0.7	1.62	1.7	21	1.50	0.8	1.67	2.3		
2			1.42	.6	1.67	2.3	22	1.67	2.3	1.62	1.7		
3			1.42	.6	1.67	2.3	23	1.62	1.7	1.58	1.3		
4			1.42	.6	1.62	1.7	24	1.58	1.3	1.62	1.7		
5			1.42	.6	1.58	1.3	25	1.54	1.0	1.62	1.7		
6			1.42	.6	1.58	1.3	26	1.50	.8	1.58	1.3		
7			1.42	.6	1.58	1.3	27	1.50	.8	1.67	2.3		
8			2.06	13.2	1.58	1.3	28	1.46	.7	1.62	1.7		
9			2.67	63	1.58	1.3	29	1.46	.7	1.58	1.3		
10			2.12	16.6	1.58	1.3	30	1.42	.6	1.58	1.3		
							31	1.42	.6	1.62	1.7		
11	1.60	1.4	1.96	9.1	1.58	1.3							
12	1.66	2.2	1.83	5.4	1.58	1.3	Mean discharge		1.37		4.98		1.53
13	1.72	3.1	1.79	4.5									
14	1.68	2.4	1.75	3.7			Second-feet per square mile		0.151		0.547		0.168
15	1.64	1.9	1.71	2.9									
16	1.60	1.4	1.75	3.7			Run-off (depth in inches on drainage area)		0.12		0.63		0.07
17	1.64	1.9	1.71	2.9			Maximum		3.1		63		2.3
18	1.60	1.4	1.67	2.3			Minimum		0.6		0.6		1.3
19		1.0	1.67	2.3			Accuracy		A		C		A
20	1.46	.7	1.67	2.3									

Daily gage height, in feet, and discharge, in second-feet, of Fortyfive Pup at claim No. 13 for 1910-1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.												
1			2.00	18.6	1.58	1.8	1.58	1.8	1.62	2.5	1.83	7.4
2			1.92	13.2	1.58	1.8	1.58	1.8	1.62	2.5		
3			1.92	13.2	1.58	1.8	1.54	1.3	1.58	1.8		
4			1.92	13.2	1.58	1.8	1.67	3.5	1.58	1.8		
5			2.08	24	1.58	1.8	1.67	3.5	1.58	1.8		
6			2.00	18.6	1.54	1.3	1.62	2.5	1.54	1.8		
7			1.92	13.2	1.54	1.3	1.58	1.8	1.54	1.3		
8			1.83	7.4	1.50	.7	1.58	1.8	1.50	.7		
9			1.75	5.5	1.50	.7	1.54	1.3	1.50	.7		
10			1.75	5.5	1.50	.7	1.54	1.3	1.54	1.8		
11			1.67	3.5	1.58	1.8	1.67	3.5	1.75	5.5		
12			1.75	5.5	1.54	1.3	1.67	3.5	1.96	15.9		
13			1.83	7.4	1.54	1.3	1.62	2.5	1.92	13.2		
14			1.92	13.2	1.58	1.8	1.62	2.5	1.79	6.6		
15			2.00	18.6	1.67	3.5	1.71	4.4	1.75	5.5		
16			1.92	13.2	1.58	1.8	1.71	4.4	1.71	4.4		
17			2.17	30	1.54	1.3	1.67	3.5	1.67	3.5		
18			2.00	18.6	1.50	.7	1.67	3.5	1.67	3.5		
19			1.83	7.4	1.50	.7	1.62	2.5	1.67	3.5		
20			1.75	5.5	1.50	.7	1.67	3.5	1.67	3.5		
21			1.75	5.5	1.50	.7	1.58	1.8	1.62	2.5		
22			1.67	3.5	1.50	.7	1.54	1.3	1.67	3.5		
23			1.67	3.5	1.50	.7	1.54	1.3	1.67	3.5		
24			1.67	3.5	1.50	.7	1.54	1.3	1.67	3.5		
25			1.67	3.5	1.50	.7	1.50	.7	1.71	4.4		
26			1.67	3.5	1.54	1.3	1.50	.7	1.71	4.4		
27			1.58	1.8	1.75	5.5	1.50	.7	1.75	5.5		
28			1.58	1.8	1.75	5.5	1.50	.7	1.75	5.5		
29			1.58	1.8	1.71	4.4	1.50	.7	1.75	5.5		
30	2.46	53.4	1.58	1.8	1.67	3.5	1.50	.7	1.79	6.6		
31	2.25	36.6			1.62	2.5	1.62	2.5				
Mean discharge				9.52		1.8		2.2		4.2		
Second-feet per square mile				1.05		0.198		0.242		0.461		
Run-off (depth in inches on drainage area)				1.17		0.22		0.27		0.51		
Maximum				30		5.5		4.4		15.9		
Minimum				1.8		0.7		0.7		0.7		
Accuracy				B		A		A		A		

Daily gage height, in feet, and discharge, in second-feet, of Fortyfive Pup at claim No. 13 for 1910–1912—Continued.

Date.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1			2.95	32		6	2.15	2.9				
2			3.20	49		6	2.50	18				
3			2.80	23		4	2.60	24				
4				20		4	2.55	21				
5				20		4		30				
6				18		4	2.90	43				
7	2.60	12		18		2	3.15	60				
8	2.60	12		16		2	2.65	27				
9	2.60	12		16		2	2.55	21				
10	2.60	12		14		2	2.50	18				
11	2.80	23		14		2	3.90	118				
12	2.95	32	2.65	14	2.10	1.8	3.00	50				
13	3.10	42	2.60	12		1.8	2.65	27				
14	3.20	49	3.00	35		1.8	2.60	24				
15	3.30	56	3.15	46	2.10	1.8	2.55	21				
16	3.10	42	3.60	77		1.8	2.45	15				
17	3.05	38		77		1.8	2.35	10				
18	2.95	32	3.60	77		1.8	2.35	10	2.50	18		
19	2.95	32	3.50	70		1.8	2.30	8.0				
20	2.80	23	3.35	74		1.8	2.25	6.0				
21	2.90	29	2.85	40	2.60	24	2.25	6.0				
22	2.90	29		35	2.85	40	2.20	4.0				
23	2.80	23		30	2.60	24	2.20	4.0				
24	2.75	20	2.60	24	2.50	18	2.15	2.9				
25	2.70	17	3.15	60	2.40	12		2.9				
26	2.70	17	3.35	74	2.35	10	2.15	2.9				
27	2.60	12	2.85	40		8		4				
28	2.80	23	2.55	21		8		4				
29	3.15	46		14		6		4				
30	2.90	29		8		4		4				
31	2.70	17				4		4				
Mean discharge		27.2		35.6		6.8		19.2				
Second-feet per square mile		2.99		3.91		0.747		2.11				
Run-off (depth in inches on drainage area)		2.78		4.36		0.86		2.43				
Maximum		56		77		40		118				
Minimum		12		8		1.8		2.9				
Accuracy		C		C		B		B				

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in South Fork of Fortymile drainage basin in 1910 to 1912:

Miscellaneous measurements in South Fork of Fortymile River drainage basin, 1910–1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 16, 1912	Deep Creek	Dennison Fork	Above ditch intake	0.24		
July 17, 1911	Mosquito Fork	South Fork	Mouth	314	1,120	0.28
July 20, 1911	do	do	do	193	1,120	.17
Aug. 23, 1911	do	do	do	198	1,120	.18
July 13, 1912	do	do	do	169	1,120	.15
Aug. 7, 1910	Gold Creek	Mosquito Fork	Above Willow Creek	2.0	57.7	.035
July 15, 1912	Chicken Creek	do	Mouth	a.8	16.3	.049
July 7, 1912	Walker Fork	South Fork	Below Wade Creek	41.9	406	.10
Aug. 27, 1911	do	do	Mouth	20.8	414	.050
July 2, 1910	Poker Creek	Walker Fork	do	1.3	3.1	.42
July 6, 1912	do	do	do	1.86	3.1	.60
July 2, 1910	Davis Creek	do	1 mile above mouth	1.5	1.5	1.00
July 6, 1912	do	do	do	1.2	1.5	.80
July 7, 1912	Wade Creek	do	Mouth	1.81	50.0	.036
July 5, 1910	Napoleon Creek	South Fork	do	1.1	13.3	.083
July 11, 1911	do	do	do	.86	13.3	.065
July 21, 1911	do	do	do	.65	13.3	.049
Aug. 27, 1911	do	do	do	.40	13.3	.030
July 7, 1912	do	do	do	.60	13.3	.045
Aug. 10, 1912	do	do	do	7.79	13.3	.59
Aug. 21, 1912	Buckskin Creek	do	do	41.1	73.7	.56

a Discharge estimated.

NORTH FORK OF FORTYMILE RIVER DRAINAGE BASIN.

DESCRIPTION.

North Fork drains an area of 2,120 square miles. The stream has its source in high rugged mountains 3,000 to 6,000 feet high. Near the headwaters the valleys are broad with gentle slopes, but nearer the mouth they become canyon-like with prominent benches which are merely continuations of those of the lower Fortymile River.

The principal tributary and that representing the main stem of the stream is Middle Fork, locally known as Granite Fork. Its drainage area is 1,110 square miles, which is 52 per cent of the total drainage of the North Fork. Its headwaters drain a country with wide flat valleys somewhat similar to those of Mosquito and Dennison forks.

North Fork above Middle Fork, locally known as Eureka Creek, has for its principal tributaries Slate, Comet, and Champion creeks. Below the junction of the two forks Bullion and Hutchinson creeks enter from the west.

There are very few people in the North Fork basin, and it has been possible to obtain only very meager stream-flow records. Some mining has been done on tributaries of Slate Creek but has now been abandoned. Hutchinson has also been the scene of mining and is still so to some extent. All mining in this basin is severely handicapped by its isolation from the source of supplies and by the very high cost of freighting.

Two power possibilities on the North Fork, one at the "kink" and another about a mile below the junction of the North and Middle forks, are described more in detail on page 329.

NORTH FORK OF FORTYMILE RIVER AT THE "KINK."

The "kink" is on North Fork, about 12 miles above the junction of that stream with South Fork, 3 miles below the mouth of Hutchinson Creek, and about 16 miles northwest of Franklin post office in an air line but nearly 40 miles by trail. A view of the "kink" is shown in Plate IX, *A*, and it is described on page 329. A gage was installed at this point on July 15, 1910, and two discharge measurements were made during that season, but it was impossible to obtain gage-height records because no observer was available. On July 17, 1912, a second gage was installed at the same control. One discharge measurement was made and scattering records of gage heights obtained. The discharge measurements are insufficient to rate the station; consequently only the results of the measurements and the record of the gage heights are published.

The daily discharge at the "kink" has been estimated from the records of Fortymile River at Steel Creek and the South Fork at Franklin. The drainage area of North Fork at the "kink" is 74 per cent of Fortymile River at Steel Creek minus that of the South Fork at Franklin. Therefore 74 per cent of the difference between the discharges at Steel Creek and at Franklin will approximate the discharge at the "kink." The errors involved by this method are largely eliminated by taking the mean for a number of days.

Discharge measurements of North Fork of Fortymile River at the "kink," 1910 and 1912.

Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*
July 15	1.09	897
Aug. 8	.48	425
1912.		
July 17	1.50	541

Daily gage height, in feet, of North Fork of Fortymile River at the "kink" for 1912.

[Drainage area, 2,010 square miles. Observer, E. G. Kenhel.]

Day.	July.	Aug.	Day.	July.	Aug.	Day.	July.	Aug.
1			11		[a] 6.5+	21		4.45
2			12		[a] 6.5+	22		
3			13			23		
4			14		6.15	24		
5		2.25	15		5.95	25		
6			16		5.25	26		
7		[a] 6.5+	17	1.50		27		
8			18	1.45		28		
9		[a] 6.5+	19		3.75	29		
10			20		3.85	30		
						31		

[a] Water reported over top of gage. Highest graduation on gage, 6.50.

Daily discharge, in second-feet, of North Fork of Fortymile River at the "kink" for 1910–1912.

Day.	July.	Aug.	Sept.
1910.			
1	....	290	326
2	....	290	326
3	....	300	290
4	....	309	528
5	....	272	696
6	....	267	696
7	....	249	770
8	....	252	696
9	352	1,940	592
10	1,040	2,720	503
11	985	1,740	503
12	1,010	1,110	503
13	925	800	473
14	930	734	408
15	606	572	408
16	511	408	1,510
17	370	340	1,760
18	230	420	1,930
19	445	384	1,520
20	421	482	1,250
1910—Continued.			
21	397	650	762
22	308	613	646
23	308	465	484
24	322	392	....
25	322	377	....
26	428	484	....
27	417	454	....
28	350	454	....
29	328	462	....
30	284	498	....
31	246	409	....
Mean discharge	502	617	817
Second-feet per square mile	0.250	0.307	0.406
Run-off (depth in inches on drainage area)	0.214	0.35	0.35
Accuracy	C	C	C

Day.	May.	June.	July.	Aug.	Sept.
1911.					
1	....	10,200	755	318	725
2	....	6,840	755	219	666
3	....	7,470	592	185	607
4	....	7,130	1,600	226	548
5	....	6,500	2,150	226	533
6	....	8,560	4,950	226	518
7	....	7,360	3,710	226	518
8	....	4,490	2,200	218	503
9	....	3,970	1,770	182	488
10	....	3,610	1,040	163	466
11	....	3,110	747	245	643
12	....	2,330	600	502	977
13	....	3,260	448	866	1,455
14	....	2,270	296	478	1,310
15	....	2,390	*a* 800	507	1,220
16	....	3,630	1,100	847	1,050
17	....	3,170	873	1,630	773
18	....	3,240	*a* 500	1,260	544
19	19,500	2,690	488	1,170	363
20	18,500	2,040	781	1,050	296
1911—Con.					
21	7,400	1,590	444	788	......
22	4,450	2,150	724	566	......
23	2,220	1,110	936	505	......
24	2,100	995	892	359	......
25	3,920	1,010	544	341	......
26	7,100	903	507	318	......
27	6,970	792	535	302	......
28	5,060	792	913	307	......
29	5,350	940	976	307	......
30	5,160	755	592	307	......
31	9,620	......	414	307	......
Mean discharge	7,540	3,510	1,080	489	710
Second-feet per square mile	3.75	1.75	0.537	0.243	0.353
Run-off (depth in inches on drainage area)	1.81	1.95	0.62	0.28	0.26
Accuracy	C	C	C	C	C

Day.	May.	June.	July.	Aug.	Sept.	Oct.
1912.						
1	......	3,140	1,380	644	1,110	733
2	......	3,000	1,010	1,070	1,150	770
3	......	6,510	1,470	1,230	1,110	814
4	......	4,090	1,880	1,100	1,020	740
5	1,540	2,870	1,580	851	1,150	666
6	1,680	1,820	1,300	618	1,150	696
7	2,020	1,270	932	435	777	725
8	2,520	888	711	8,140	733	681
9	2,220	836	563	2,020	600	607
10	3,420	1,220	511	1,420	725	574
11	2,320	1,550	514	2,600	962	570
12	3,110	1,250	577	9,910	873	540
13	3,510	4,030	703	5,100	651	481
14	5,570	5,820	755	1,920	637	......
15	4,140	3,040	792	1,710	766	......
16	4,310	9,950	829	1,360	885	......
17	4,180	13,900	688	1,050	736	......
18	4,990	13,000	570	1,130	1,180	......
19	3,940	10,100	525	1,820	2,570	......
20	2,400	10,100	496	1,900	2,180	......
1912—Con.						
21	2,400	8,000	525	1,900	1,780	......
22	2,720	5,520	3,230	1,810	1,380	......
23	2,920	6,070	2,310	1,500	1,180	......
24	2,640	6,070	1,370	1,400	1,060	......
25	1,360	4,280	1,070	1,500	903	......
26	1,060	4,770	1,020	1,350	555	......
27	755	3,610	1,320	1,210	452	......
28	940	2,520	1,490	1,860	341	......
29	3,310	1,370	1,200	1,580	341	......
30	7,620	1,210	918	1,450	385	......
31	5,570	......	666	1,160	......	......
Mean discharge	3,240	4,740	1,060	2,150	1,010	661
Second-feet per square mile	1.61	2.36	0.527	1.07	0.503	0.329
Run-off (depth in inches on drainage area)	1.62	2.63	0.61	1.23	0.56	0.16
Accuracy	C	C	C	C	C	C

a Discharges interpolated.

NORTH FORK OF FORTYMILE RIVER ABOVE MIDDLE FORK.

This station was located at the North Fork telegraph station of the Signal Corps of the United States Army, about a mile above the mouth of the Middle Fork and about 40 miles southwest of Eagle in an air line. The station was established July 15, 1910, and gage-height observations were made for the remainder of the summer. The telegraph station was abandoned by the Signal Corps in the winter of 1910-11, making it impracticable to continue stream-flow records at this point.

Discharge measurements of North Fork of Fortymile River above Middle Fork, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
July 16	2.14	242	Aug. 18		1,060
17	2.00	194	1912.		
Aug. 22	1.95	170	July 18		250
23	1.90	155			
Sept. 12	2.29	294			

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Fortymile River above Middle Fork for 1910.

[Drainage area, 724 square miles. Observer, E. H. Lathrop.]

Day.	July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.92	162	1.83	135	2.00	189
2			1.92	162	2.04	204	1.92	162
3			1.88	149	3.0	714		
4			1.83	135	2.85	622		
5			1.79	125	2.65	504		
6			1.71	106	2.85	622		
7			1.67	99	2.65	504		
8			2.00	189	2.65	504		
9			4.1	1,420	2.60	475		
10			3.3	904	2.42	377		
11			2.85	622	2.42	377		
12			2.60	475	2.33	330		
13			2.33	330	2.33	330		
14			2.17	256	2.25	292		
15	2.17	256	2.08	219	2.90	653		
16	2.11	230	2.04	204	3.7	1,160		
17	2.00	189	2.08	219	3.4	968		
18	1.92	162	2.04	204	3.7	1,160		
19	2.00	189	2.08	219	3.2	840		
20	2.00	189	2.08	219	2.90	653		
21	1.92	162	2.04	204	2.60	475		
22	1.92	162	2.00	189		419		
23	2.08	219	1.92	162		374		
24	2.04	204	1.90	155	2.33	330		
25	2.08	219	1.92	162	2.17	256		
26	1.92	162	1.90	155	2.17	256		
27	1.88	149	1.92	162	2.08	219		
28	1.88	149	2.00	189	2.00	189		
29	1.79	125	1.98	182	1.92	162		
30	1.75	116	1.92	162	2.00	189		
31	1.83	135	1.83	135				
Mean discharge		177		267		477		
Second-feet per square mile		0.244		0.369		0.659		
Run-off (depth in inches on drainage area)		0.15		0.42		0.74		
Maximum		256		1,420		1,160		
Minimum		116		99		135		
Accuracy		A		B		B		

CONFEDERATE CREEK AT MOUTH.

This station was located at the mouth of Confederate Creek, about 27 miles from Franklin post office. It was maintained for about a month in 1912. The drainage basin of Confederate Creek is somewhat greater than that of Hutchinson Creek above Confederate but is very similar in character. The slow-melting glaciers and snow banks in the high rugged mountains in which the stream heads furnish a relatively good water supply.

Discharge measurements of Confederate Creek at mouth, 1912.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 11	....	a 4.9
July 16	0.25	.73
Aug. 18	.83	14.8

a Measurement made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Confederate Creek at mouth for 1912.

[Drainage area, 9 square miles. Observer, E. M. Webster.]

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
1					0.75	11
2					.60	6.4
3					.55	5.1
4						5.1
5						5.1
6						15
7					1.25	40
8					1.00	24
9					.75	11
10					.65	7.9
11		4.9			1.50	57
12					1.40	50
13					1.00	24
14					.90	18
15					.85	16
16			0.40	2.8	.85	16
17			.40	2.8	.75	11
18			.40	2.8	.85	16
19			.40	2.8	.85	16
20			.40	2.8		
21			0.65	7.9		
22			.70	9.4		
23			.65	7.9		
24			.60	6.4		
25			.60	6.4		
26			.80	13		
27			.65	7.9		
28			.65	7.9		
29			.60	6.4		
30			.75	11		
31			.80	13		
Mean discharge				6.95		18.7
Second-feet per square mile				0.772		2.08
Run-off (depth in inches on drainage area)				0.46		1.47
Maximum				13		57
Minimum				2.8		5.1
Accuracy				B		B

HUTCHINSON CREEK BELOW CONFEDERATE CREEK.

A gage was installed on Hutchinson Creek, just below the mouth of Confederate Creek and about 27 miles by trail from Franklin post office, on July 13, 1910, and scattering records were obtained during 1910 and 1911. During the summer of 1912 the gage-height records were practically continuous. The channel shifted somewhat during 1910 and 1911, but in 1912 the effect of shifts was probably negligible.

Discharge measurements of Hutchinson Creek below Confederate Creek, 1910–1912.

Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*
July 13	1.24	7.3
14	1.21	5.8
Aug. 7	1.09	1.7
9	1.53	35.0
21	1.25	3.9
1911.		
July 13	1.35	4.50
14	1.58	7.12
Aug. 20	1.42	5.45
1912.		
June 11	1.50	[a] 8.2
July 16	1.42	4.47
Aug. 18	1.73	25.3

[a] Measurements made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Hutchinson Creek below Confederate Creek for 1911–12.

[Drainage area, 16.6 square miles. Observer, E. M. Webster.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.						
1						
2						
3						
4						
5					1.67	12
6					1.58	7.3
7					1.71	15
8					1.75	18
9					1.79	21
10					1.84	26
11					3.1	172
12					3.0	158
13	1.33	4.3			2.8	132
14	1.58	7.3			2.8	132
15					1.92	34
1911—Con.						
16					1.84	26
17						
18						
19						
20			1.42	5.3		
21						
22			1.58	7.3		
23						
24			1.50	6.3		
25					2.7	120
26						
27						
28						
29	1.42	5.3				
30						
31			1.50	6.3		

Daily gage height, in feet, and discharge, in second-feet, of Hutchinson Creek below Confederate Creek for 1911–12—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1			1.85	37	1.40	4.0	1.90	42
2			2.10	62	1.60	14	1.75	27
3			1.85	37	1.60	14	1.65	18
4			1.80	32	1.50	8.0		18
5			1.75	27	1.35	3.0		18
6			1.70	22	1.20	1.2		30
7			1.65	18	1.35	3.0	2.15	67
8			1.70	22	1.40	4.0	2.00	52
9			1.65	18	1.40	4.0	1.90	42
10			1.60	14	1.40	4.0	1.85	37
11			1.45	6.0	1.45	6.0	2.65	126
12			2.05	57	1.40	4.0	2.00	52
13			2.45	102	1.60	14	1.90	42
14			2.40	96	1.55	11	1.85	37
15			2.85	151	1.55	11	1.75	27
16			2.10	62	1.45	6.0	1.75	27
17			2.15	67	1.45	6.0	1.85	37
18			1.70	22	1.40	4.0	1.75	27
19			1.40	a 22	1.35	3.0	1.75	27
20			1.75	27	1.40	4.0	1.75	27
21			1.70	22	1.80	32	1.75	27
22			1.80	32	1.80	32	1.85	37
23	1.90	42	1.95	47	1.75	27	1.85	37
24	1.80	32	2.30	84	1.65	18	1.75	27
25	1.95	47	2.30	84	1.60	14	1.75	27
26	2.10	62	2.15	67	2.10	62	1.85	37
27	2.30	84	2.10	62	1.95	47	1.90	42
28	2.15	67	1.95	47	1.90	42		35
29	2.15	67	1.65	18	1.85	37		35
30	1.95	47	1.40	4.0	1.75	27		35
1	1.85	37			1.90	42		35
Mean discharge		53.9		45.6		16.4		37.[illegible]
Second-feet per square mile		3.25		2.75		0.988		2.2[illegible]
Run-off (depth in inches on drainage area)		1.09		3.07		1.14		2.5[illegible]
Maximum		84		151		62		12[illegible]
Minimum		32		4.0		1.2		1[illegible]
Accuracy		B		B		B		B

a Discharge interpolated.

HUTCHINSON CREEK BELOW MONTANA CREEK.

On July 14, 1910, a gage was installed on Hutchinson Creek just below the mouth of Montana Creek and about 2 miles below the mouth of Hutchinson Creek. Occasional records were obtained for three seasons. Channel shifts necessitated the use of a different rating table for each season, but the errors due to this cause are probably not very great. The records at this station, with those below Confederate Creek, give a fairly comprehensive idea of the flow of Hutchinson Creek.

Discharge measurements of Hutchinson Creek below Montana Creek, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
July 14	1.44	10.1	July 13	1.37	7.71
Aug. 8	1.27	5.1	14	1.80	27.7
9	2.33	88.0	Aug. 20	1.50	11.6
22	1.33	7.9	1912.		
			June 11	1.71	[a] 10.5
			July 16	1.50	7.49
			Aug. 18	2.21	36.1

[a] Measurements made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Hutchinson Creek below Montana Creek for 1910–1912.

[Drainage area, 29 square miles. Observer, Jack McLin.]

Day.	July.		August.		Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1910.					1910—Con.				
1			1.23	4.5	21	1.33	6.7		16
2			1.21	4.1	22	1.33	6.7	1.38	8.2
3			1.21	4.1	23	1.34	7.0		9.2
4			1.21	4.1	24	1.31	6.1		10.2
5			1.19	3.7	25	1.25	4.8		11.2
6			1.19	3.7	26	1.23	4.5		12.2
7			1.19	3.7	27	1.23	4.5		13.2
8			2.21	73	28	1.23	4.5		14.2
9			2.33	88	29	1.23	4.5	1.54	15.2
10				78	30	1.24	4.7		
11			2.17	69	31	1.25	4.8		
12			2.00	51					
13				51	Mean discharge		5.88		28.8
14	1.44	10.5		51					
15		8.6		51	Second-feet per square mile		0.203		0.993
16	1.33	6.7	2.00	51					
17	1.31	6.1		44	Run-off (depth in inches on drainage area)		0.14		1.07
18	1.28	5.4		37	Maximum		10.5		88
19	1.26	5.0		30	Minimum		4.5		3.7
20	1.25	4.8		23	Accuracy		B		C

Day.	July.		August.		September.		Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.							1911—Con.						
1					2.90	186	16						
2							17						
3					2.75	158	18						
4							19						
5							20						
6							21						
7							22						
8							23						
9							24	2.00	42				
10							25			1.50	12	3.00	205
11			2.50	110	3.00	205	26			2.33	78		
12					3.35	270	27						
13	1.33	6.8					28						
14							29	1.58	15.2				
15			1.58	15.2	1.92	36	30			2.00	42		
							31			2.80	167		

Daily gage height, in feet, and discharge, in second-feet, of Hutchinson Creek below Montana Creek for 1910-1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1									1.75	14
2					2.70	74				
3										
4			1.90	19						
5							1.80	15	1.65	11
6										
7							3.00	104		
8										
9										
10										
11			1.70	12			3.55	170		
12			2.55	62	1.45	6.7	3.05	110		
13										
14			3.55	170						
15										
16	2.70	74	3.05	110	1.50	7.6				
17			4.0	224						
18	2.90	94					2.20	34		
19										
20	3.00	104								
21										
22										
23	2.80	84			1.65	11				
24										
25			2.55	62			2.15	31		
26					1.80	15				
27					1.20	3.0				
28										
29							2.65	70		
30					1.20	3.0				
31										

MONTANA CREEK AT CLAIM "NO. 7 ABOVE."

This station is located on Montana Creek at claim "No. 7 above," about a mile above the junction with Hutchinson Creek. It was established July 14, 1910. Records have been obtained for three summers. The rating curve is rather poorly defined and many periods of the daily discharges are estimated. The values of the monthly means are probably within 15 per cent of the true values. The tributary drainage is small, and in July and August the water supply is often inadequate for placer-mining operations. In the winter glaciers are formed in the V-shaped canyon of the creek which do not melt until far into the summer.

Discharge measurements of Montana Creek at claim "No. 7 above," 1910-1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
July 14	0.85	1.20	June 11	1.06	[a] 2.5
Aug. 8	.75	.46	July 16	.90	1.02
9	1.33	14.0	Aug. 18	1.17	6.77
22	.88	1.60			
1911.					
July 14	.84	1.16			
Aug. 19	.96	2.17			

[a] Measurement made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Montana Creek at claim "No. 7 above" for 1910–1912.

[Drainage area, 5.9 square miles. Observer, Jack McLin.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.						
1			0.75	0.5	0.83	1.1
2			.75	.5	.83	1.1
3			.75	.5	.83	1.1
4			.75	.5	.83	1.1
5			.75	.5	.88	1.5
6			.75	.5	.88	1.5
7			.75	.5	.88	1.5
8			1.42	19.4	.88	1.5
9			1.50	25	.85	1.2
10			1.14	7.0	.85	1.2
11			1.03	4.3	.88	1.2
12			1.00	3.6	.83	1.1
13			.95	2.8	.83	1.1
14	0.84	1.2	.93	2.4	.83	1.1
15	.83	1.1	.91	2.1	.83	1.1
16	.83	1.1	.92	2.2	.83	1.1
17	.80	.8	.92	2.2	.83	1.1
18	.79	.8	.92	2.2	.83	1.1
19	.77	.7	.92	2.2	.83	1.1
20	.75	.5	.92	2.2	.94	2.6
21	.75	.5	.92	2.2	.92	2.2
22	.75	.5	.88	1.5	.92	2.2
23	.76	.5	.88	1.5		
24	.77	.7	.88	1.5		
25	.75	.5	.85	1.2		
26	.75	.5	.85	1.2		
27	.75	.5	.85	1.2		
28	.75	.5	.85	1.2		
29	.75	.5	.83	1.1		
30	.75	.5	.83	1.1		
31	.75	.5	.83	1.1		
Mean discharge		0.66		3.09		1.35
Second-feet per square mile		0.112		0.524		0.229
Run-off (depth in inches on drainage area)		0.07		0.60		0.19
Maximum		1.2		25		2.6
Minimum		0.5		0.5		1.1
Accuracy		C		C		C

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.						
1			0.84	1.2	1.44	20
2			.84	1.2	1.37	16.0
3			.84	1.2	1.20	8.8
4			.84	1.2	1.04	4.4
5			.84	1.2	1.03	4.2
6			.84	1.2	1.02	3.9
7			.84	1.2		3.7
8			.84	1.2		3.5
9			.84	1.2	1.00	3.5
10			.84	1.2		6.5
11			.98	3.2	1.30	12.6
12			.96	2.9	1.25	10.7
13			.96	2.9	1.20	8.8
14	0.88	1.7	.97	3.0	1.17	7.9
15	.94	2.5	1.02	3.9		10
16	.84	1.2	1.04	4.4		10
17	.84	1.2	1.04	4.4		10
18	.84	1.2	.98	3.2		10
19	.84	1.2	.96	2.9		10
20	.84	1.2	.95	2.7		12
21	.98	3.2	.92	2.2		12
22	1.00	3.5	.95	2.7		12
23	.86	1.5	.97	3.0		12
24	.88	1.7	.88	1.7		12
25	.84	1.2	.86	1.5	1.33	14.1
26	.88	1.7	1.12	6.3		
27	.92	2.2	1.17	7.9		
28	.88	1.7	1.06	4.8		
29	.84	1.2	1.00	3.5		
30	.84	1.2	1.03	4.2		
31	.84	1.2	1.37	16.0		
Mean discharge		1.69		3.20		9.56
Second-feet per square mile		0.286		0.543		1.62
Run-off (depth in inches on drainage area)		0.19		0.63		1.51
Maximum		3.5		16.0		20
Minimum		1.2		1.2		3.5
Accuracy		C		C		C

Daily gage height, in feet, and discharge, in second-feet, of Montana Creek at claim "No. 7 above," for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1				14		4.0		3.8	1.10	3.8
2				25	1.55	24		3.8		3.8
3				15		16		3.8		3.8
4				14		8.0		3.8		3.8
5				11	1.10	3.8	1.10	3.8	1.10	3.8
6				9.0		3.0		20		
7				7.0		3.0	2.00	50		
8				9.0		3.0	1.50	22		
9				7.2		2.0	1.40	17		
10				5.6		2.0		17		
11			1.10	3.8		2.0	2.00	50		
12			1.60	27		2.0	1.50	22		
13			1.60	27		1.0	1.40	17		
14			2.00	50		1.0		14		
15	1.55	24	1.65	30		1.0		12		
16	1.60	27	1.50	22	.90	1.0		10		
17	1.50	22	2.25	65	.90	1.0		8.0		
18	1.45	20	1.75	35	.90	1.0	1.15	5.9		
19	1.50	22	1.60	27		.9	1.15	5.9		
20	1.45	20	1.50	22	.85	.8		5.9		
21	1.65	30	1.50	22	1.25	10		4.8		
22	1.60	27		24		8.0		4.8		
23	1.45	20	1.60	27	1.15	5.9		4.8		
24	1.35	15	1.55	24		5.9		3.8		
25	1.35	15	1.55	24	1.15	5.9	1.10	3.8		
26	1.30	12		18	1.15	5.9		3.8		
27	1.30	12	1.35	15	1.10	3.8		3.8		
28	1.60	27	1.25	10		3.8		3.8		
29	1.70	32		4.5	1.10	3.8	1.10	3.8		
30		18		4.5	1.10	3.8		3.8		
31		14				3.8		3.8		
Mean discharge		21.0		20.0		4.55		11.0		3.80
Second-feet per square mile		3.56		3.39		0.771		1.86		0.644
Run-off (depth in inches on drainage area)		2.25		3.78		0.89		2.14		0.12
Maximum		32		65		24		50		3.8
Minimum		12		3.8		0.8		3.8		3.8
Accuracy		C		C		C		C		C

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in North Fork of Fortymile River drainage basin, 1910 to 1912:

Miscellaneous measurements in North Fork of Fortymile River drainage basin in 1910–1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
July 16, 1910	Middle Fork	North Fork	Mouth	397	1,110.0	0.36
July 18, 1910	Slate Creek	do	do	40	336	.12
July 19, 1912	do	do	do	75.7	336	.23
July 18, 1910	North Fork	Fortymile River	Above Slate Creek	16.8	109	.15
July 19, 1912	do	do	do	59.0	109	.54
Do	Comet Creek	North Fork	Mouth	36.4	60.5	.60
Aug. 26, 1910	Champion Creek	do	Below Arkansas Creek	8.8	43.4	.20
Sept. 11, 1910	do	do	do	13.8	43.4	.32
Aug. 16, 1911	do	do	do	33.6	43.4	.78
Aug. 25, 1910	do	do	Above Bear Creek	14.1	125	.11
Aug. 17, 1911	do	do	Below Bear Creek	87.5	173	.50
July 17, 1910	do	do	Mouth	78	179	.44
July 19, 1912	do	do	do	34.8	179	.19
July 5, 1911:						
3 p. m.	Quartz Creek	Champion Creek	Telegraph line	6.94		
8 p. m.	do	do	do	a 48		
Aug. 25, 1910	Bear Creek	do	Mouth	9.0	48.0	.19
Aug. 17, 1911	do	do	do	28.6	48.0	.60
Aug. 22, 1910	Bullion Creek	North Fork	do	14.6	34.3	.43
Aug. 18, 1911	do	do	do	8.97	34.3	.26
July 18, 1912	do	do	do	5.54	34.3	.16
July 18, 1912	Hutchinson Creek	do	do	11.2	71.3	.16

a Discharge estimated.

LOWER FORTYMILE RIVER DRAINAGE BASIN.

DESCRIPTION.

Fortymile River is formed by the junction of North and South forks, about 40 miles in an air line from the mouth. Throughout this distance, which is approximately 60 miles by river, the pronounced V-shaped valley has cut about 500 feet below an old valley floor. The river is joined by O'Brien, Flat, Steel, Twin, Nugget, Canyon, Smith, Moose, and Uncle Sam creeks. The largest of these is O'Brien Creek, which has for tributaries King Solomon Creek, Liberty Fork, and Columbia, Alder, and Dome creeks. Moose Creek lies almost entirely in Canadian territory. All these streams have heavy gradients and at their mouths have cut deeply into the high bench lands.

Mining has been done on several of these creeks, but principally on Dome Creek and tributaries of Canyon Creek. The bars and benches along the river have been mined extensively. The benches still offer possibilities for considerable development, but the bars have been worked repeatedly by snipers with rockers and do not offer very strong inducements for further work by this method. The river bed has been mined by dredging for a few miles near the boundary and also on South Fork. Probably the greater portion of the river will ultimately be dredged.

A few ditches have been built on the lower Fortymile and others are under construction or are planned. From Smith Creek a ditch and flume divert water and carry it to a point near the mouth, where it is taken across the Fortymile in a pipe supported by a suspension bridge, for use in mining about half a mile below. At Moose Creek a 3-mile conduit composed of about half ditch and half flume diverts from Elmer Creek, a tributary of Moose Creek rising in American territory, and carries the water up the valley to Claghorn Bar.

KING SOLOMON CREEK AT LIBERTY CABIN.

Scattered records have been obtained on King Solomon Creek at Liberty Cabin, about 28 miles south of Eagle. In 1910 two discharge measurements were made. On June 10, 1911, a gage was installed and occasional gage-height observations and discharge measurements were made during 1911 and 1912. From these records the characteristics of the flow of this creek may be closely judged.

Discharge measurements of King Solomon Creek at Liberty Cabin in 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 27		17.3	June 2	3.15	36.4
July 30		5.7	July 2	2.43	11.2
			Aug. 3	3.04	32.8
1911.			30	2.77	21.2
July 6	3.92	117			
7	3.52	65.7			
28	3.68	82.3			
Sept. 9	2.40	9.41			

Daily gage height, in feet, and discharge, in second-feet, of King Solomon Creek at Liberty Cabin for 1911–12.

[Drainage area, 54.2 square miles. Observers: John B. Powers, 1911; Henry Friday, 1912.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1			2.50	12	2.50	12	3.00	30		
2			2.45	10	2.40	9	2.80	22		
3			2.70	18						
4			2.70	18						
5			3.85	105						
6			4.05	136						
7			3.45	60						
8			3.15	39	2.10	4	2.45	10		
9				38	2.10	4				
10	4.60	240	3.10	36	2.40	9	2.60	15		
11	4.95	326	3.05	33			2.60	15	2.40	9
12			2.80	22						
13				19						
14				16						
15				13						
16				10						
17	3.70	86	2.30	7	2.90	26	3.10	36		
18	3.65	80		6	3.10	36	2.80	22		
19				5						
20			2.10	4	2.60	15				
21	3.40	56	2.20	5	2.60	15	2.80	22	2.00	3
22				6						
23				12						
24			2.90	26						
25			3.00	30						
26			3.15	39						
27	2.70	18	3.60	74	2.50	12	3.00	30		
28	2.60	15	3.55	69	2.50	12	3.00	30		
29			3.15	39						
30			2.90	26						
31			2.70	18						
Mean discharge				30.7						
Second-feet per square mile				0.567						
Run-off (depth in inches on drainage area)				0.63						
Maximum				136						
Minimum				4						
Accuracy				B						

Daily gage height, in feet, and discharge, in second-feet, of King Solomon Creek at Liberty Cabin for 1911-12—Continued.

Day.	June.		July.		August.		Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.							1912.						
1				10	3.50	64	21			3.40	56		32
2	3.80	98	2.45	10	3.50	64	22				52		30
3	4.15	153		15	3.05	33	23				48		28
4	3.00	30		10	3.00	30	24				44		26
5				10	2.90	26	25				38		24
6				9	3.00	30	26				34		22
7			2.40	9	5.20	396	27			3.00	30		38
8	3.50	64	2.40	9	4.25	171	28			3.00	30		32
9				7	3.80	98	29				28		26
10	3.00	30	2.20	5	3.65	80	30				26	2.75	20
11	2.90	26	2.40	9	3.90	112	31				24	2.80	22
12	2.80	22		9	4.55	230							
13				8	4.05	136	Mean discharge				19.1		70.3
14	3.00	30		8	3.70	86							
15				8	3.60	74	Second-feet per square mile				0.352		1.30
16				7	3.55	69							
17			2.30	7	3.40	56							
18	3.00	30	2.30	7	3.25	45							
19				10	3.20	42							
20			2.60	15	3.10	36	Run-off (depth in inches on drainage area)				0.41		1.50
							Maximum				56		396
							Minimum				5		20
							Accuracy				C		B

LIBERTY FORK AT MOUTH.

In 1911 a gage was installed on Liberty Fork about 200 yards above its junction with King Solomon Creek, near the mail trail from Eagle to Chicken. Occasional observations were made by travelers along the trail during the summers of 1911 and 1912. The control showed a considerable tendency to shift, but the comparatively frequent measurements probably eliminated any great error.

Discharge measurements of Liberty Fork at mouth in 1910-1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 27		19.4	June 2	3.91	40.1
July 30		4.9	July 2	3.48	10.0
1911.			Aug. 3	3.86	29.4
July 7	4.10	35.9	30	3.73	19.6
28	3.85	17.2			
Sept. 9	3.55	10.2			

Daily gage height, in feet, and discharge, in second-feet, of Liberty Fork at mouth for 1911–12.

[Drainage area, 43.1 square miles. Observer, John B. Powers.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1										
2					3.50	8.5			4.00	26
3										
4										
5										
6										
7			4.25	50						
8					3.40	7.2	3.55	9.2	3.70	12.5
9							3.55	9.2		
10	4.15	40								
11					3.80	15.5			3.65	11.2
12			3.90	20						
13										
14										
15										
16										
17			3.55	9.3	3.90	20	3.90	20		
18										
19										
20										
21			3.50	8.5	3.40	7.2	3.80	15.5		
22										
23										
24										
25										
26					3.60	10.0				
27			3.80	15.5			4.00	26		
28			3.85	17.8						
29										
30					3.80	15.5				
31										

Day.	June.		July.		August.		Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.							1912—Con.						
1							16						
2	3.90	36	3.50	11	5.20	390	17			3.80	24		
3					3.85	30	18						
4					3.85	30	19						
5							20						
6							21			4.60	200		
7			3.50	11			22						
8							23						
9							24						
10							25						
11	3.40	8	3.50	11			26						
12							27			4.20	96		
13	3.60	14					28						
14	3.60	14					29						
15							30					3.75	21
							31						

DOME CREEK AT AUBURN MINING CO.'S CAMP.

A station was located on Dome Creek at the camp of the Auburn Mining Co., on the mail trail from Eagle to Chicken, about 12 miles north of Steel Creek post office. Miscellaneous measurements were made at this point in 1910 and 1911 and sufficient gage-height observations and discharge measurements were obtained in 1912 for making an estimate of the daily discharge for a period of three months. A ditch to divert from Dome Creek about 4 miles above the station has been surveyed. These records give a basis for estimating the water supply available for this ditch in a year when the run-off was probably somewhat above the normal.

Discharge measurements of Dome Creek at Auburn Mining Co.'s camp, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 28		14.8	June 14	2.98	[a] 4.3
			July 2	2.82	2.71
1911.			Aug. 4	3.06	7.36
June 9	3.50	20.3	Aug. 30	3.05	7.40
July 7	3.10	5.91			
27	2.95	4.54			
Sept. 4	2.80	2.83			
6	2.75	2.50			

[a] Measurement made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Dome Creek at Auburn Mining Co.'s camp for 1912.

[Drainage area, 24.9 square miles. Observer, John Barry.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1				2.2		9.0	3.20	11
2	4.20	47	2.80	2.2		8.4	3.10	8.4
3				2.2	3.10	8.4	3.10	8.4
4				2.2	3.05	7.2	3.20	11
5				1.1		7.2	3.20	11
6				1.1		7.2	3.10	8.4
7			2.70	1.1	3.90	35	3.30	14
8				1.1		30	3.20	11
9				1.1		25	3.30	14
10				1.1		20	3.40	17
11			2.70	1.1	4.20	47	3.30	14
12				1.1		41	3.40	17
13				2.2	3.90	35	3.20	11
14	3.00	6.0		2.2		31	3.20	11
15				2.2	3.70	27		11
16				2.2		24	3.20	11
17			2.80	2.2		22	3.50	20
18	3.00	6.0		2.2		20	3.80	31
19				2.2		18	3.60	23
20				2.2	3.35	16	3.70	27
21			3.70	27	3.40	17	3.50	20
22				24		16		15
23				21		12		10
24				18		10		10
25				15		10		10
26				12		10		10
27	3.10	8.4	3.20	11		8.0		10
28				10		8.0		10
29				10		8.0	3.10	8.4
30				10	3.05	7.2	3.10	8.4
31				9.0	3.20	11		
Mean discharge				6.52		17.9		13.4
Second-feet per square mile				0.262		0.719		0.538
Run-off (depth in inches on drainage area)				0.30		0.83		0.60
Maximum				27		47		31
Minimum				1.1		7.2		8.4
Accuracy				C		B		B

STEEL CREEK AT MOUTH.

A gage was installed on Steel Creek about 150 yards above its mouth, at the Steel Creek road house, on June 28, 1910, and records were obtained throughout the season. On June 7, 1911, the gage was reinstalled a short distance above its original position, and records were obtained during 1911 and 1912. The ratings are well defined, and the results should be almost accurate.

Discharge measurements of Steel Creek at mouth, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
June 28	2.53	36	July 26	2.32	9.30
29	2.37	18.6	Sept. 2	2.05	3.39
30	2.22	9.1	1912.		
July 31	1.63	.2	June 3	2.74	32.8
Aug. 16	2.12	5.8	13	2.01	a 1.4
1911.			July 3	1.90	1.30
June 7	2.40	10.6	Aug. 5	2.00	2.23
July 8	2.15	4.48	6	2.27	6.74
22	1.78	.83	6	2.52	18.1

a Measurement made by floats.

Daily gage height, in feet, and discharge, in second-feet, of Steel Creek at mouth for 1910–1912.

[Drainage area, 12.5 square miles. Observers: T. E. Phillips, 1910; J. A. Kemp, 1911–12.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			2.08	4.6	1.65	0.4	2.00	3.0
2			2.01	3.2	1.64	.3	2.00	3.0
3			1.92	2.1	1.62	.3	2.00	3.0
4			1.86	1.5	1.60	.2	2.00	3.0
5			1.85	1.4	1.56	.1	2.02	3.4
6			1.98	2.8	1.55	.1	2.25	10.5
7			1.92	2.1	1.58	.2	2.20	8.0
8			1.88	1.7	2.12	5.6	2.12	5.6
9			1.81	1.1	3.48	161	2.10	5.0
10			1.78	.9	2.45	26	2.10	5.0
11			1.78	.9	2.25	10.5	2.05	4.0
12			1.76	.8	2.14	6.2	2.05	4.0
13			2.12	5.6	2.06	4.2	2.05	4.0
14			2.10	5.0	2.00	3.0	2.05	4.0
15			2.00	3.0	1.93	2.2	2.05	4.0
16			1.92	2.1	2.05	4.0	2.20	8.0
17			1.86	1.5	2.05	4.0	2.32	14.6
18			1.82	1.2	2.08	4.6	2.29	12.5
19			1.80	1.0	2.10	5.0	2.25	10.5
20			1.78	.9	2.05	4.0	2.20	8.0
21			1.75	.8	2.02	3.4	2.15	6.5
22			1.77	.8	1.97	2.7		
23			1.76	.8	1.96	2.6		
24			1.74	.7	1.98	2.8		
25			1.72	.6	2.02	3.4		
26			1.70	.5	2.20	8.0		
27			1.68	.4	2.10	5.0		
28	2.53	36	1.66	.4	2.15	6.5		
29	2.34	16.2	1.65	.4	2.10	5.0		
30	2.20	8.0	1.62	.3	2.02	3.4		
31			1.60	.2	2.00	3.0		
Mean discharge		20.1		1.59		9.28		6.17
Second-feet per square mile		1.61		0.127		0.742		0.494
Run-off (depth in inches on drainage area)		0.18		0.15		0.86		0.38
Maximum		36		5.6		161		14.6
Minimum		8.0		0.2		0.1		3.0
Accuracy		A		B		C		A

Daily gage height, in feet, and discharge, in second-feet, of Steel Creek at mouth for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1			2.55	20	1.75	0.6	1.92	1.5	2.05	3.0
2			2.32	8.5	1.70	.4	1.90	1.3	2.00	2.3
3			2.10	3.7	1.78	.7	1.88	1.2	2.00	2.3
4			2.12	4.1	1.90	1.3	1.98	2.1	1.95	1.8
5			2.50	17	2.45	14	1.95	1.8		1.8
6			2.55	20	2.50	17	1.92	1.5		1.8
7			2.40	11.4	2.35	9.6	1.88	1.2		1.8
8			2.25	6.6	2.15	4.6	1.82	.9		1.8
9			2.25	6.6	2.02	2.6	1.80	.8	1.95	1.8
10			2.25	6.6	1.92	1.5	1.80	.8	1.95	1.8
11			2.30	7.8	1.90	1.3	2.20	5.5	2.00	2.3
12			2.22	6.0	1.85	1.0	2.20	5.5	2.55	20
13			2.10	3.7	1.80	.8	2.02	2.6	2.95	50
14			2.10	3.7	1.75	.6	2.05	3.0	2.70	30
15			2.00	2.3	1.98	2.1	2.20	5.5	2.45	14
16			2.05	3.0	1.92	1.5	2.25	6.6	2.25	6.6
17			2.02	2.6	1.90	1.3	2.28	7.3	2.05	3.0
18			2.02	2.6	1.90	1.3	2.15	4.6	1.90	1.3
19			2.00	2.3	1.88	1.2	2.15	4.6	1.90	1.3
20			1.82	.9	1.80	.8	2.08	3.4	1.88	1.2
21			1.80	.8	1.80	.8	2.00	2.3		
22			1.80	.8	1.78	.7	1.98	2.1		
23	2.55	20	1.80	.8	1.80	.8	1.90	1.3		
24	2.52	18	1.80	.8	2.65	26	1.90	1.3		
25	2.68	29	1.80	.8	2.35	9.6	1.90	1.3		
26	2.55	20	1.78	.7	2.32	8.5	1.90	1.3		
27	2.40	11.4	1.75	.6	2.35	9.6	1.90	1.3		
28	2.22	6.0	1.75	.6	2.35	9.6	1.90	1.3		
29	2.20	5.5	1.75	.6	2.18	5.1	1.90	1.3		
30	3.30	82	1.75	.6	2.05	3.0	1.90	1.3		
31	2.90	46			2.00	2.3	1.95	1.8		
Mean discharge		26.4		4.88		4.52		2.53		7.48
Second-feet per square mile		2.11		0.390		0.362		0.202		0.598
Run-off (depth in inches on drainage area)		0.70		0.44		0.42		0.23		0.46
Maximum		82		20		26		7.3		50
Minimum		5.5		0.6		0.4		0.8		1.2
Accuracy		B		B		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Steel Creek at mouth for 1910–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1			1.90	1.3	1.95	1.8	2.10	3.7
2			1.85	1.0	2.15	4.6	2.10	3.7
3	2.80	38	1.90	1.3	2.00	2.3	2.15	4.6
4	2.25	6.6	1.90	1.3	2.00	2.3	2.10	3.7
5	2.35	9.6	1.80	.8	2.00	2.3	2.10	3.7
6	2.20	5.5	1.80	.8	2.10	3.7	2.10	3.7
7	2.10	3.7	1.80	.8	2.65	26	2.10	3.7
8	2.10	3.7	1.75	.6	2.40	11	2.10	3.7
9	2.15	4.6	1.70	.4	2.30	7.8	2.10	3.7
10	2.00	2.3	1.70	.4	2.30	7.8	2.20	5.5
11	2.00	2.3	1.60	.2	3.35	87	2.20	5.5
12	1.95	1.8	1.60	.2	2.90	46	2.15	4.6
13	2.00	2.3	1.65	.3	2.35	9.6	2.20	5.5
14	2.45	14	1.70	.4	2.25	6.6	2.25	6.6
15	2.40	11	1.70	.4	2.30	7.8	2.20	5.5
16	2.70	30	1.65	.3	2.25	6.6	2.25	6.6
17		18	1.70	.4	2.20	5.5	2.30	7.8
18		14	1.70	.4	2.30	7.8	3.45	97
19		14	1.70	.4	2.30	7.8	3.40	92
20		14	1.70	.4	2.25	6.6	2.80	38
21		14	1.85	1.0	2.10	3.7	2.65	26
22	2.45	14	2.55	20	2.20	5.5	2.55	20
23	2.40	11	2.20	5.5	2.20	5.5	2.40	11
24	2.20	5.5	2.20	5.5	2.15	4.6	2.30	7.8
25	2.10	3.7	2.10	3.7	2.15	4.6	2.20	5.5
26	2.15	4.6	2.00	2.3	2.10	3.7	2.20	5.5
27	2.10	3.7	2.60	23	2.10	3.7	2.20	5.5
28	2.00	2.3	2.20	5.5	2.15	4.6	2.20	5.5
29	1.90	1.3	2.10	3.7	2.10	3.7	2.15	4.6
30	1.80	.8	2.00	2.3	2.15	4.6	2.10	3.7
31			1.90	1.3	2.10	3.7		
Mean discharge		9.15		2.77		7.44		13.3
Second-feet per square mile		0.731		0.222		0.595		1.06
Run-off (depth in inches on drainage area)		0.76		0.26		0.69		1.18
Maximum		38		23		87		97
Minimum		0.8		0.2		1.8		3.7
Accuracy		A		A		A		A

CANYON CREEK BELOW SQUAW GULCH.

Stations were maintained on Canyon Creek below Squaw Gulch during 1910, 1911, and 1912, each year at a different location. In 1910 the gage was a mile below Squaw Gulch; in 1911, 2 miles below; and in 1912 about 200 yards below. The drainage areas of the stations differ slightly; therefore, strictly, the discharges are not comparable without correction, though for all practical purposes they may be so considered.

In 1912 the daily gage heights were obtained from occasional gage readings at the station and continuous gage readings at the mouth of Canyon Creek. The relation between the gages was determined, and thus the gage heights for the missing periods were supplied. The means are probably accurate within 15 per cent.

Discharge measurements of Canyon Creek 1 mile below Squaw Gulch, 1910–11.

Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*
July 2	2.13	11.3
Aug. 1	2.08	9.5
17	2.42	31.0
1911.		
Aug. 31	2.20	10.1

Daily gage height, in feet, and discharge, in second-feet, of Canyon Creek 1 mile below Squaw Gulch for 1910.

[Drainage area, 58.4 square miles. Observer, Mrs. A. Gustavason.]

Day.	July.		Aug.		Sept.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.08	9.6	2.25	18.0
2	2.13	11.7	2.00	6.8	2.25	18.0
3	2.10	10.3	2.00	6.8	2.25	18.0
4	2.10	10.3	2.00	6.8	2.50	39
5	2.15	12.6	2.00	6.8	2.50	39
6	2.45	34	1.95	5.7	2.20	15.0
7	2.75	72	2.00	6.8	2.20	15.0
8	2.15	12.6	2.75	72	2.50	39
9	2.15	12.6	4.00	348	2.50	39
10	2.15	12.6	3.75	288	2.60	50
11	2.15	12.6	3.30	181	2.65	57
12	2.45	34	3.10	137	2.75	72
13	2.90	97	3.00	116	2.75	72
14	2.75	72	2.80	80	2.75	72
15		51	2.75	72	2.80	80
16	2.40	29		62	2.85	88
17	2.20	15.0		50	2.85	88
18	2.25	18.0	2.50	39	2.90	97
19	2.15	12.6	2.15	12.6	3.00	116
20	2.05	8.6	2.25	18.0		
21	2.15	12.6	2.20	15.0		
22	2.20	15.0	2.25	18.0		
23	2.25	18.0	2.35	25		
24	2.10	10.3	2.40	29		
25	2.10	10.3	2.45	34		
26	2.10	10.3	2.50	39		
27	2.15	12.6	2.55	44		
28	2.05	8.6	2.20	15.0		
29	2.00	6.8	2.05	8.6		
30	2.05	8.6	2.15	12.6		
31	2.05	8.6	2.25	18.0		
Mean discharge		22.0		57.5		54.3
Second-feet per square mile		0.377		0.984		0.930
Run-off (depth in inches on drainage area)		0.42		1.13		0.66
Maximum		97		348		116
Minimum		6.8		5.7		15.0
Accuracy		A		C		B

Discharge measurements of Canyon Creek 2 miles below Squaw Gulch, 1911.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 6	3.10	*a* 1.20
July 23	2.00	3.94
Aug. 31	2.62	8.28

a Discharge estimated.

Daily gage height, in feet, and discharge, in second-feet, of Canyon Creek 2 miles below Squaw Gulch for 1911.

[Drainage area, 59.5 square miles.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1					2.50	7.2	2.67	8.7
2					2.46	6.9	2.67	8.7
3					2.50	7.2	2.58	7.9
4					2.58	7.9	2.58	7.9
5	2.60	8.1			2.50	7.2	2.58	7.9
6	3.10	120			2.50	7.2	2.54	7.6
7					2.46	6.9	2.54	7.6
8					2.46	6.9	2.54	7.6
9					2.46	6.9		
10					2.58	7.9		
11					3.12	13.5		
12					2.79	9.8		
13					2.75	9.4		
14					2.75	9.4		
15					2.84	10.3		
16					2.92	11.0		
17					2.84	10.3		
18					2.84	10.3		
19					2.75	9.4		
20					2.67	8.7		
21					2.67	8.7		
22					2.58	7.9		
23			2.00	3.9	2.58	7.9		
24			2.42	6.6	2.58	7.9		
25			2.50	7.2	2.54	7.6		
26			2.50	7.2	2.54	7.6		
27			2.58	7.9	2.54	7.6		
28			2.75	9.4	2.54	7.6		
29			2.58	7.9	2.54	7.6		
30			2.50	7.2	2.58	7.9		
31			2.50	7.2	2.67	8.7		
Mean discharge				7.17		8.43		7.99
Second-feet per square mile				0.121		0.142		0.161
Run-off (depth in inches on drainage area)				0.04		0.16		0.05
Maximum				9.4		13.5		8.7
Minimum				3.9		6.9		7.6
Accuracy				A		A		A

Discharge measurements of Canyon Creek below Squaw Gulch, 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 5	2.66	46.7	Aug. 8	2.98	82.0
July 5	2.10	7.83	23	2.54	34.7

Daily gage height, in feet, and discharge, in second-feet, of Canyon Creek below Squaw Gulch for 1912.

[Drainage area, 56.5 square miles.]

Day.	June.		July.		August.		September.	
	Gage height	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1							2.45	27
2							2.45	27
3							2.40	23
4							2.50	31
5	2.65	46	2.10	7.8			2.45	27
6					3.75	195	2.55	36
7					3.50	155	2.85	67
8					3.10	99	2.85	67
9					2.85	67	3.10	99
10					2.85	67	3.20	113
11					4.40	300	3.15	106
12					3.60	171	2.85	67
13					3.45	148	2.55	36
14					3.15	106	2.70	51
15					2.90	73	2.55	36
16					2.85	67	2.45	27
17					2.70	51	2.60	41
18					2.70	51	4.00	235
19					2.85	67	3.15	106
20					2.70	51	3.40	141
21					2.60	41	3.15	106
22					2.60	41	2.80	61
23					2.60	41	2.60	41
24					2.50	31	2.70	51
25					2.45	27	2.55	36
26					2.40	23	2.85	67
27					2.60	41	2.80	61
28					2.60	41		
29					2.55	36		
30					2.45	27		
31					2.55	36		
Mean discharge						79.0		66.1
Second-feet per square mile						1.40		1.17
Run-off (depth in inches on drainage area)						1.35		1.17
Maximum						300		235
Minimum						23		23
Accuracy						C		C

SQUAW GULCH AT CLAIM "NO. 1 ABOVE."

This station was established at claim "No. 1 above," on Squaw Gulch, one-half mile below Baby Creek, 1½ miles above the mouth, and about 18 miles from Steel Creek post office, on July 3, 1910, and was maintained at the same point during three seasons. The ratings are fairly well defined for low stages.

Discharge measurements of Squaw Gulch at claim "No. 1 above," 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
July 3	1.79	2.5	June 4	1.29	24.1
Aug. 2	1.67	1.5	July 5	.55	1.61
17	2.19	11.0	Aug. 8	1.29	22.9
1911.			23	1.20	10.4
June 6	2.67	50.8			
July 23	1.52	*a*.30			
Sept. 1	1.75	2.97			

a Discharge estimated.

Daily gage height, in feet, and discharge, in second-feet, of Squaw Gulch at claim "No. 1 above" for 1910–1912.

[Drainage area, 24.4 square miles. Observer, Frank Montgomery.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.						
1	......	......	1.62	1.2	2.00	5.9
2	......	......	1.58	1.0	2.00	5.9
3	1.88	3.8	1.62	1.2	2.12	8.9
4	1.92	4.5	1.58	1.0	2.04	6.9
5	1.88	3.8	1.58	1.0	2.00	5.9
6	2.17	10.5	1.54	.8	2.17	10.5
7	2.12	8.9	1.54	.8	2.21	11.8
8	2.00	5.9	2.50	27	2.17	10.5
9	1.92	4.5	3.58	143	......	10.5
10	1.88	3.8	2.67	43	......	14.8
11	2.00	5.9	2.50	27	2.33	16.8
12	2.08	7.8	2.17	10.5	2.42	21
13	2.92	70	2.08	7.8	2.50	27
14	2.75	52	2.00	5.9	2.75	52
15	2.54	31	2.96	75	......	66
16	2.29	15.0	2.50	27	3.00	79
17	2.12	8.9	2.04	6.9	2.83	60
18	2.00	5.9	2.17	10.5	2.50	27
19	1.88	3.8	2.25	13.4	......	32
20	1.83	3.1	2.12	8.9	......	30
21	1.83	3.1	2.00	5.9	......	29
22	1.79	2.6	1.83	3.1	......	28
23	1.79	2.6	2.00	5.9	......	27
24	1.75	2.2	2.12	8.9	......	27
25	1.75	2.2	2.21	11.8	2.50	27
1910—Con.						
26	1.71	1.8	2.21	11.8	2.25	13.4
27	1.67	1.5	2.17	10.5	2.17	10.5
28	1.62	1.2	2.17	10.5	2.17	10.5
29	1.58	1.0	1.92	4.5	......	......
30	1.58	1.0	2.04	6.9	......	......
31	1.58	1.0	2.00	5.9	......	......
Mean discharge	......	9.29	......	16.1	......	24.1
Second-feet per square mile	......	0.381	......	0.660	......	0.988
Run-off (depth in inches on drainage area)	......	0.41	......	0.76	......	1.03
Maximum	......	70	......	143	......	79
Minimum	......	1.0	......	0.8	......	5.9
Accuracy	......	B	......	C	......	C

Daily gage height, in feet, and discharge, in second-feet, of Squaw Gulch at claim "No. 1 above" for 1910-1912—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1			1.67	1.9	1.58	0.7	1.75	3.1		
2			1.67	1.9	1.54	.6	1.75	3.1		
3			1.75	3.1	1.54	.6	1.75	3.1		
4			1.75	3.1	1.54	.6	1.71	2.5		
5			1.92	6.7	1.52	.5	1.71	2.5		
6			1.84	4.7	1.52	.5	1.71	2.5		
7			1.84	4.7	1.52	.5	1.71	2.5		
8	3.00	85	1.75	3.1	1.50	.3				
9	2.92	76	1.67	1.9	1.50	.3				
10	2.84	68	1.67	1.9	1.54	.6				
11	2.84	68	1.62	1.2	1.62	1.2			2.50	38
12	2.75	59	1.58	.7	1.62	1.2				
13	2.58	44	1.58	.7	1.62	1.2				
14	2.42	32	1.58	.7	1.75	3.1				
15	2.33	26	1.67	1.9	1.79	3.7				
16	2.25	21	1.62	1.2	1.84	4.7				
17	2.25	21	1.62	1.2	1.84	4.7				
18	2.25	21	1.58	.7	1.92	6.7				
19	2.17	16.5	1.58	.7	1.84	4.7				
20	2.13	14.4	1.58	.7	1.79	3.7				
21	2.08	12.2	1.58	.7	1.75	3.1				
22	2.08	12.2	1.58	.7	1.75	3.1				
23	2.00	9.2	1.52	.5	1.71	2.5				
24	1.92	6.7	1.52	.5	1.67	1.9				
25	1.92	6.7	1.52	.5	1.67	1.9				
26	1.92	6.7	1.54	.6	1.67	1.9				
27	1.88	5.6	1.54	.6	1.67	1.9				
28	1.88	5.6	1.71	2.5	1.62	1.2				
29	1.84	4.7	1.71	2.5	1.62	1.2				
30	1.75	3.1	1.62	1.2	1.62	1.2				
31			1.58	.7	1.71	2.5				
Mean discharge		27.2		1.73		2.02		2.76		
Second-feet per square mile		1.11		0.071		0.083		0.114		
Run-off (depth in inches on drainage area)		0.95		0.08		0.10		0.03		
Maximum		85		6.7		6.7		3.1		
Minimum		3.1		0.5		0.3		2.5		
Accuracy		C		B		B		B		

Daily gage height, in feet, and discharge, in second-feet, of Squaw Gulch at claim "No. 1 above" for 1910–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1			1.10	14	1.90	79	1.30	14
2			1.10	14	1.80	67	1.20	10.5
3			1.00	10.5	1.60	47	1.30	14
4	1.30	24	.80	5.5	1.50	39	1.30	14
5	1.30	24	.60	2.2	1.70	57	1.40	18
6	1.20	18	.60	2.2	1.90	79	1.40	18
7	1.20	18	.60	2.2	1.70	57	1.50	24
8	1.20	18	.60	2.2	1.30	24	1.50	24
9	1.20	18	.60	2.2	1.30	24	1.50	24
10	1.10	14	.60	2.2	1.30	24	1.40	18
11	1.10	14	.65	3.0	2.25	120	1.40	18
12	1.20	18	.70	3.7	2.15	108	1.30	14
13	1.30	24	.80	5.5	1.90	79	1.30	14
14	1.30	24	.80	5.5	1.75	62	1.20	10.5
15	1.40	31	.90	7.7	1.60	47	1.20	10.5
16	1.50	39	.90	7.7	1.50	39	1.20	10.5
17	1.40	31	1.00	10.5	1.40	31	1.40	18
18	1.30	24	1.00	10.5	1.45	35	3.00	175
19	1.30	24	1.00	10.5	1.50	39	2.50	100
20	1.40	31	1.00	10.5	1.40	31	2.40	100
21	1.65	52	1.30	24	1.30	14	2.20	80
22	1.75	62	1.70	57	1.30	14	2.10	79
23	1.60	47	1.80	67	1.20	10.5	1.80	47
24	1.45	35	1.70	57	1.20	10.5	1.70	39
25	1.30	24	1.70	57	1.20	10.5	1.60	31
26	1.30	24	1.60	47	1.35	16	1.50	24
27	1.20	18	1.60	47	1.50	24	1.40	18
28	1.10	14	1.50	39	1.50	24	1.30	14
29	1.10	14	1.50	39	1.50	24	1.20	10.5
30	1.10	14	1.60	47	1.40	18	1.20	10.5
31			1.70	57	1.30	14		
Mean discharge		25.9		21.6		40.9		33.4
Second-feet per square mile		1.06		0.885		1.68		1.37
Run-off (depth in inches on drainage area)		1.06		1.02		1.94		1.53
Maximum		62		67		120		175
Minimum		14		2.2		10.5		10.5
Accuracy		B		B		C		C

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the lower Fortymile River drainage basin in 1910 to 1912:

Miscellaneous measurements in Lower Fortymile River drainage basin, 1910–1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
July 8, 1911	Dick Dole Creek	O'Brien Creek	Forks	2.75	13.1	0.21
Aug. 26, 1912	Canyon Creek	Fortymile River	Mouth	49.2	86.5	.57
Aug. 27, 1912	do	do	do	59.0	86.5	.68
July 5, 1912	Woods Creek	Canyon Creek	Above Camp Creek	1.01	6.1	.17
Do	Camp Creek	do	Mouth	2.00	5.4	.37
Do	Hall Creek	do	do	3.90	12.0	.32
Aug. 26, 1912	Marion Creek	do	do	[a] 2.5	11.0	.26
Aug. 28, 1912	Smith Creek	Fortymile River	do	7.5	28.4	.23
Do	Moose Creek	do	do	18.0		
Do	Moose Creek ditch		2 miles below intake	.70		
Aug. 29, 1912	Discovery Creek	Fortymile River	Mouth	[a] 1.1	3.4	.32

[a] Discharge estimated.

MISSION CREEK DRAINAGE BASIN.

DESCRIPTION.

Mission Creek drains a very asymmetric basin between the Fortymile and Seventymile basins and the Yukon. The water of the creek comes almost entirely from the northern and eastern slopes of Glacier Mountain, flowing northerly to join the main creek at the very northern edge of its basin. The main creek flows north to its junction with Excelsior Creek, about 8 miles above its mouth, where it makes a short bend and flows nearly due east to its confluence with the Yukon at Eagle. Wolf Creek joins Mission Creek about 4 miles, and American Creek about 1 mile, from the Yukon.

American Creek, the largest tributary of Mission Creek, rises in the high ridges bounding the extreme northern part of Fortymile River basin. It flows northeastward and is about 20 miles in length. Discovery Fork is the main branch of American Creek and joins it about 8 miles above the mouth. Above Marion Creek, a small feeder from the east, American Creek flows through a narrow V-shaped canyon; below Marion Creek its valley widens until it merges in the flats adjoining Mission Creek. The creek has a sharp grade, especially near the head, the average grade in the portion where mining is carried on being about 125 feet to the mile. American Creek has been an important gold producer.

MISSION CREEK ABOVE OREGON CREEK.

This station was located near the head of Mission Creek, just below the mouth of Oregon Creek. It was maintained during the summer of 1911. One discharge measurement was made and gage-height records were kept through the summer. The data are insufficient for making a reliable estimate of daily discharge.

A discharge measurement made on August 2 showed a gage height of 2.15 feet and a discharge of 12.2 second-feet.

Daily gage height, in feet, of Mission Creek above Oregon Creek for 1911.

[Drainage area, 20 square miles. Observer, John Ott.]

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1					16			2.40	
2			2.10	2.20	17	3.50		2.50	
3		2.30			18	3.10			
4		2.30			19	3.10			
5		2.60		2.40	20		2.00		
6		2.40	2.00		21	2.80		2.30	
7		2.30	2.00	2.40	22		2.40		
8		2.20			23	2.50		2.20	
9			2.00	2.50	24		2.20	2.20	
10		2.10	2.00		25	2.40		2.00	
11			2.40	2.40	26		2.40		
12		2.10			27	2.50	2.30		
13		2.10	2.20		28	2.50	2.30		
14		2.10	2.40		29	2.40			
15				2.30	30		2.20		
					31				

MISSION CREEK ABOVE COLORADO CREEK.

A gaging station was maintained on Mission Creek above Colorado Creek for about 1½ months in 1910. The rating curve is well defined. The creek heads in the Glacier Mountains, some points of which exceed 6,000 feet in elevation. The late-melting snows on these mountains furnish Mission Creek with a comparatively dependable water supply.

Discharge measurements of Mission Creek above Colorado Creek, 1910.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 25	3.11	108
July 24	2.78	51
Aug. 29	2.89	65

Daily gage height, in feet, and discharge, in second-feet, of Mission Creek above Colorado Creek for 1910.

[Drainage area, 84.8 square miles. Observer, Mr. Powers.]

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
1			3.58	239	2.92	70
2			3.04	93	2.83	56
3			2.92	70	2.75	48
4			2.92	70	2.67	42
5			3.62	251	2.67	42
6			2.92	70	2.62	38
7			2.83	56		
8			2.75	48		
9			2.75	48		
10			2.67	42		
11			2.67	42		
12			3.04	93		
13			3.00	84		
14			2.83	56		
15			2.67	42		
16			2.75	48		
17			2.75	48		
18			2.67	42		
19			2.67	42		
20			2.67	42		

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
21			2.75	48		
22			2.88	62		
23			2.83	56		
24			2.75	48		
25	3.12	111	2.67	42		
26	3.08	102	2.67	42		
27	3.08	102	2.67	42		
28	3.17	124	2.62	38		
29	3.25	144	2.62	38		
30	3.17	124	2.58	35		
31			3.00	84		
Mean discharge		118		66.5		49.3
Second-feet per square mile		1.39		0.784		0.581
Run-off (depth in inches on drainage area)		0.31		0.90		0.13
Maximum		144		251		70
Minimum		102		35		38
Accuracy		A		B		A

WOLF CREEK ABOVE SWANSON'S DAM.

This station was established on Wolf Creek just above Swanson's dam, about 4 miles from the mouth of the creek, on June 30, 1910, and gage readings were obtained for about a month. The rating is well defined.

Discharge measurements of Wolf Creek above Swanson's dam, 1911.

Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*
June 30	2.33	8.20
Aug. 1	2.20	5.37
Sept. 12	2.80	22.2

Daily gage height, in feet, and discharge, in second-feet, of Wolf Creek above Swanson's dam for 1911.

[Drainage area, 19.5 square miles. Observers, Swanson and Coffin.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.30	7.5	2.20	5.0		
2			2.20	5.0	2.20	5.0		
3			2.30	7.5	2.10	3.5		
4			2.30	7.5				
5			2.20	5.0				
6			2.20	5.0				
7			2.20	5.0				
8			2.20	5.0				
9			2.20	5.0				
10			2.10	3.5				
11			2.10	3.5				
12			2.10	3.5			2.80	22
13			2.10	3.5				
14			2.10	3.5				
15			2.10	3.5				
16			2.10	3.5				
17			2.00	2.0				
18			2.00	2.0				
19			2.00	2.0				
20			2.00	2.0				
21			2.15	4.3				
22			2.35	8.8				
23			2.25	6.2				
24			2.15	4.2				
25			2.50	13.0				
26			3.35	45				
27			2.90	26				
28			2.70	19.0				
29			2.45	11.5				
30	2.30	7.5	2.30	7.5				
31			2.30	7.5				
Mean discharge				7.68		4.50		
Second-feet per square mile				0.394		0.231		
Run-off (depth in inches on drainage area)				0.45		0.03		
Maximum				45		5.0		
Minimum				2.0		3.5		
Accuracy				B		B		

AMERICAN CREEK AT CLAIM "NO. 8 ABOVE."

This station was established on American Creek at claim "No. 8 above," about 1½ miles above the mouth of Discovery Fork and 11 miles from Eagle, on June 26, 1910. In 1910 and 1911 the records of gage heights were somewhat broken, necessitating estimates of many daily discharges. In 1912 the record was continuous, but channel shifts decreased the accuracy of the results.

Discharge measurements of American Creek at claim "No. 8 above," 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
June 26	2.67	13.4	June 15	3.37	61.6
July 29	2.46	5.6	July 4	2.67	6.59
Aug. 27	2.58	7.9	Aug. 3	2.61	4.80
Sept. 10	2.79	19.6			
15	3.04	40.0	1912.		
			June 18	2.92	19.1
			July 30	2.54	15.6
			Sept. 3	2.42	12.4

Daily gage height, in feet, and discharge, in second-feet, of American Creek at claim "No. 8 above" for 1910–1912.

[Drainage area, 24.1 square miles. Observer, August Fritch.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			2.79	19.4		8.0	2.54	7.7
2			2.67	12.6		7.7	3.00	36
3			2.67	12.6		7.4		25
4			2.62	10.4		7.1	2.71	14.6
5			3.92	145		6.8	2.67	12.6
6			3.00	36		6.5		11.4
7			2.75	17.0		6.2		10.1
8			2.67	12.6	2.94	31	2.58	8.9
9			2.62	10.4	3.00	36		13.0
10			2.58	8.9	3.44	84	2.79	19.4
11			2.71	14.6	3.33	71	2.71	14.6
12			2.75	17.0	3.17	54	2.58	8.9
13			2.62	10.4	2.75	17.0		11.6
14			2.58	8.9	2.67	12.6	2.71	14.6
15				7.7	2.58	8.9	3.06	42
16				7.7		8.9	3.08	44
17				7.7		8.9	3.08	44
18				7.7		8.9		30
19				8.9		8.9	2.75	17.0
20				7.7		8.9		17.0
21				7.7		8.9	2.75	17.0
22				7.7		8.9		
23				7.7		8.9		
24				7.7		8.9		
25			2.54	7.7		8.9		
26	2.67	12.6		7.2		8.9		
27	2.67	12.6		6.7	2.58	8.9		
28	2.67	12.6		6.2		6.9		
29	2.62	10.4	2.46	5.7	2.42	4.9		
30	3.17	54	2.46	5.7		4.5		
31			2.56	8.3	2.38	4.2		
Mean discharge		20.4		14.9		15.9		20.0
Second-feet per square mile		0.846		0.618		0.660		0.830
Run-off (depth in inches on drainage area)		0.16		0.71		0.76		0.65
Maximum		54		145		84		44
Minimum		10.4		5.7		4.2		7.7
Accuracy		B		C		C		B

Daily gage height, in feet, and discharge, in second-feet, of American Creek at claim "No. 8 above" for 1910–1912—Continued.

Date.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1				11.5	2.67	6.5		
2			2.75	10.8		5.5	2.88	18.7
3				8.5		5.0		
4			2.67	6.5		4.5		
5				12.0		4.0		
6			2.92	21		3.5		
7			2.84	16.1		3.0	2.75	10.8
8			2.79	13.0		3.0		
9			2.79	13.0	2.58	2.6		
10			2.75	10.8		6.0		
11			2.75	10.8	2.75	10.8		
12			2.71	8.6		10.8		
13				8.0	2.75	10.8		
14				7.0		10.8		
15	3.37	62	2.67	6.5	2.75	10.8		
16	3.33	57		5.0		10.5		
17	3.33	57		4.0	3.43	68		
18		49		3.0	3.08	33		
19	3.17	41	2.58	2.6		25		
20		36	2.58	2.6	2.84	16.1		
21		32		4.0		10.0		
22	3.00	27		4.0		8.0		
23		25		10.0		7.0		
24		23	2.90	20		7.0		
25	2.92	21	3.08	33		7.0		
26	2.88	18.7	3.25	49	2.67	6.5		
27	2.84	16.1	3.00	27				
28	2.92	21	2.92	21				
29	2.88	18.7		16.0				
30		16.0		10.0				
31			2.71	8.6				
Mean discharge		32.5		12.4		11.4		
Second-feet per square mile		1.35		0.515		0.473		
Run-off (depth in inches on drainage area)		0.80		0.59		0.46		
Maximum		62		49		68		
Minimum		16.0		2.6		2.6		
Accuracy		B		B		B		

Daily gage height, in feet, and discharge, in second-feet, of American Creek at claim "No. 8 above" for 1910–1912—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1			2.65	5.9	2.60	20	2.40	11	2.40	11
2			2.60	4.4	2.60	20	2.40	11	2.40	11
3			2.60	4.4	2.60	20	2.40	11	2.40	11
4			2.55	3.4	2.55	16	2.45	14	2.40	11
5			2.55	3.4	2.60	20	2.45	14	2.40	11
6			2.50	2.4	2.60	20	2.50	17	2.40	11
7			2.45	2.0	3.40	108		19	2.40	11
8			2.40	1.6	2.90	53		19	2.40	11
9			2.40	1.6	2.75	38	2.55	21	2.40	11
10			2.35	1.3	2.75	38	2.60	25	2.40	11
11			2.50	2.4	3.30	103	2.55	21	2.40	11
12			3.00	26	3.10	77	2.55	21	2.40	11
13	2.90	18	2.95	22	2.90	53	2.50	17	2.35	9
14	2.90	18	2.80	12	2.85	48	2.50	17	2.35	9
15	3.10	34	2.65	5.9	2.75	38	2.50	17	2.35	9
16	3.00	26	2.60	4.4	2.70	34	2.50	17	2.35	9
17	2.95	22	2.55	3.4	2.60	25	2.60	25	2.35	9
18	2.90	18	2.50	2.4	2.60	25	2.65	29		
19	2.85	15	2.50	2.4	2.70	34	2.60	25		
20	2.85	15	2.45	2.0	2.60	25	2.60	25		
21	2.95	22	3.00	26	2.60	25	2.60	25		
22	3.00	26	3.15	39	2.60	25	2.60	25		
23	2.95	22	2.80	37	2.60	25	2.55	21		
24	2.90	18	2.65	24	2.55	21	2.55	21		
25	2.90	18	2.60	20	2.55	21	2.50	17		
26	2.90	18	2.60	20	2.50	17	2.50	17		
27	2.8	15	2.60	20	2.50	17	2.45	14		
28	2.80	12	2.55	16	2.50	17	2.45	14		
29	2.75	9.7	2.55	16	2.50	17	2.45	14		
30	2.70	7.4	2.60	20	2.45	14	2.40	11		
31			2.60	20	2.45	14				
Mean discharge		18.6		12.0		33.2		18.5		10.4
Second-feet per square mile		0.772		0.498		1.38		0.767		0.432
Run-off (depth in inches on drainage area)		0.52		0.57		1.59		0.86		0.27
Maximum		34		39		108		29		11
Minimum		7.4		1.3		14		11		9
Accuracy		B		C		C		C		B

AMERICAN CREEK AT UNITED STATES PUMPING PLANT.

On June 14, 1910, a gage was installed on American Creek at the United States pumping plant, about a mile from Eagle. Records were kept through the summer of 1910 and for a portion of the summer of 1911. In 1912 it was possible to obtain but a few scattered readings.

Discharge measurements of American Creek at United States pumping plant, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
June 14	2.22	41	June 13	2.40	185
24	2.13	33	29	1.22	21.1
July 26	2.01	25	Sept. 12	2.55	233
28	1.91	15.8	13	2.41	183
Aug. 28	2.00	19.4			
Sept. 9	2.19	142	1912.		
15	2.70	64	May 20	1.95	87.7
16	2.58	125	Aug. 1	1.60	32.4
19	2.46	88			

Daily gage height, in feet, and discharge, in second-feet, of American Creek at United States pumping plant for 1910–1912.

[Drainage area, 67.3 square miles. Observers: J. B. Tait, 1910; Joseph Shotshok, 1911.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.										
1			2.02	24	2.00	22	2.00	22	2.15	36
2			2.22	45	2.00	22	2.30	57	2.15	36
3				34	2.00	22	2.65	146	2.00	22
4			2.02	24	1.90	15.0	2.45	87	2.00	22
5			2.40	75	1.80	11.2	2.30	57	2.00	22
6			2.22	45	1.85	13.1	2.30	57	2.00	22
7			2.02	24	1.85	13.1	2.25	50	2.00	22
8			2.00	22	2.10	30	2.20	42	2.00	22
9			2.00	22	3.40	541	2.20	42	2.10	30
10			1.90	15.0	2.45	87	2.25	50	2.00	22
11			1.90	15.0	2.40	75	2.25	50	2.00	22
12			2.10	30	2.30	57	2.20	42	2.00	22
13			2.20	42	2.25	50	2.20	42	2.00	22
14	2.22	45	2.20	42	2.25	50	2.25	50		
15	2.20	42	2.20	42	2.05	26	2.70	165		
16	2.25	50		32	2.10	30	2.55	114		
17	3.80	779	2.00	22	2.10	30	2.50	99		
18	2.80	208	2.20	42	2.10	30	2.58	122		
19	2.50	99	2.20	42	2.05	26	2.45	87		
20	2.40	75	2.00	22	2.20	42	2.25	50		
21	2.30	57	2.00	22	2.12	32	2.20	42		
22	2.20	42	2.00	22	2.15	36	2.20	42		
23	2.20	42	2.20	42	2.15	36	2.20	42		
24	2.13	34	2.10	30	2.05	26	2.20	42		
25	2.10	30	2.00	22	2.05	26	2.20	42		
26	2.03	24	2.10	30	2.10	30	2.20	42		
27	2.02	24	1.90	15.0	2.10	30	2.20	42		
28	2.00	22	1.90	15.0	2.10	30	2.10	30		
29		26	1.90	15.0	2.05	26	2.10	30		
30	2.10	30	1.90	15.0	2.00	22	2.15	36		
31			1.90	15.0	2.00	22				
Mean discharge		95.8		29.2		48.7		60.7		24.8
Second-feet per square mile		1.42		0.434		0.724		0.902		0.368
Run-off (depth in inches on drainage area)		0.90		0.50		0.83		1.01		0.18
Maximum		779		75		541		165		36
Minimum		22		15.0		11.2		22		22
Accuracy		C		B		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of American Creek at United States pumping plant for 1910–1912—Continued.

Day.	June.		July.		Day.	June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1911.					1911—Con.				
1			1.40	30	21	1.60	46	1.00	18
2			1.10	20	22	1.50	38	1.40	30
3			1.30	26	23	1.50	38	1.30	26
4			1.20	23	24	1.40	30	1.20	23
5			1.40	30	25	1.40	30	1.50	38
6			1.50	38	26	1.20	23	1.80	70
7			1.50	38	27	1.30	26	1.80	70
8			1.20	23	28	1.30	26	1.80	70
9			1.30	26	29	1.40	30	1.60	46
10			1.10	20	30	1.30	26	1.30	26
11			1.20	23	31			1.10	20
12			1.00	18					
13	2.40	185	1.20	23	Mean discharge		73.9		29.6
14	2.30	160	1.30	26					
15	2.20	138	1.00	18	Second-feet per square mile		1.10		0.440
16	2.20	138	1.00	18					
17	2.10	119	1.00	18	Run-off (depth in inches on drainage area)		0.74		0.51
18	2.10	119	1.20	23	Maximum		185		70
19	2.00	100	1.00	18	Minimum		23		18
20	1.70	57	1.20	23	Accuracy		B		B

Day.	May.		June.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1					1.60	32		
2								
3								
4								
5							1.55	28
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19			1.55	28				
20	1.95	88						
21								
22	1.95	88						
23								
24								
25								
26								
27								
28								
29								
30								
31	1.90	79						

DISCOVERY FORK OF AMERICAN CREEK BELOW STAR GULCH.

This station was located about one-half mile above the junction of Discovery Fork with American Creek, one-fourth mile below Star Gulch, and about 10 miles from Eagle. It was established June 27, 1910, and has been maintained for three seasons, a different gage location being used each season. In 1910 gage heights are lacking for a number of periods, and the discharges have been estimated. In 1911 the records are unbroken, and the rating is well defined. In 1912 the station showed a slight tendency to shift; the rating curve for that season is not very well defined.

Discharge measurements of Discovery Fork of American Creek below Star Gulch, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
June 27	2.00	1.9	July 5	2.96	4.52
July 29	1.88	1.0	28	3.11	6.81
Aug. 26	2.03	4.0	Aug. 2	2.83	4.07
Sept. 10	2.17	8.4	Sept. 14	3.17	7.54
14	2.17	8.2			
15	2.42	24.0	1912.		
16	2.42	23.0	May 22	4.04	10.8
			June 18	3.79	3.68
1911.			July 30	3.69	3.93
June 15	3.21	17.2	Sept. 3	3.72	3.42
July 4	2.67	3.19			

Daily gage height, in feet, and discharge, in second-feet, of Discovery Fork of American Creek below Star Gulch for 1910–1912.

[Drainage area, 14.8 square miles. Observer, M. Danielson.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			2.00	2.7		1.0	2.00	2.7
2			1.92	1.5		1.0	2.58	36
3			1.90	1.2		2.0	2.42	24
4			1.90	1.2		3.0	2.25	12.4
5			1.90	1.2		6.0	2.25	12.4
6			1.90	1.2		10.0		10.4
7			1.85	.9	2.29	14.6		8.4
8			1.85	.9	2.67	44		6.3
9			1.85	.9	2.25	12.4	2.21	10.2
10			1.83	.8		10.0	2.17	8.4
11			2.00	2.7		8.0	2.17	8.4
12			3.00	73		6.0	2.12	6.3
13			2.42	24		4.0		8.0
14			2.21	10.2	2.04	3.8		12.4
15			2.00	2.7	2.02	3.2		12.4
16			2.00	2.7	2.04	3.8	2.29	14.6
17			1.92	1.5	2.04	3.8	2.38	21
18			1.92	1.5	2.06	4.3	2.25	12.4
19			2.00	2.7		4.2		11.2
20			1.92	1.5		4.2	2.21	10.2
21			1.92	1.5		4.1		9.0
22			1.92	1.5		4.1		7.5
23			1.92	1.5		4.0	2.12	6.3
24			1.92	1.5		4.0	2.12	6.3
25			1.92	1.5		3.9		6.7
26			1.92	1.5	2.04	3.8	2.14	7.1
27	2.00	2.7	1.92	1.5	2.02	3.2		
28	2.21	10.2	1.83	.8	2.02	3.2		
29	2.62	40	1.84	.8		3.0		
30	2.21	10.2		.8		3.0		
31				.8		2.8		
Mean discharge		15.8		4.80		6.08		11.2
Second-feet per square mile		1.07		0.324		0.411		0.757
Run-off (depth in inches on drainage area)		0.16		0.37		0.47		0.73
Maximum		40		73		44		36
Minimum		10.2		0.8		1.0		2.7
Accuracy		C		C		C		C

Daily gage height, in feet, and discharge, in second-feet, of Discovery Fork of American Creek below Star Gulch for 1910-1912—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1			2.79	3.9	2.84	7.2	3.08	6.6	3.00	5.8
2			2.79	3.9	2.84	7.2	3.00	5.8	2.84	4.3
3			2.77	3.8	2.84	7.2	2.96	5.4	2.88	4.6
4			2.75	3.7	2.84	7.2	2.92	5.0	2.84	4.3
5			2.94	5.2	2.84	7.2	2.92	5.0	2.84	4.3
6			2.84	4.3	2.84	7.2	2.92	5.0	2.84	4.3
7			2.79	3.9	2.84	7.2	2.92	5.0	2.79	3.9
8			2.79	3.9	2.79	3.9	2.92	5.0	2.79	3.9
9			2.77	3.8	2.77	3.8	2.92	5.0	2.79	3.9
10			2.75	3.7	2.81	4.1	2.92	5.0	2.79	3.9
11			2.79	3.9	3.00	5.8	3.12	7.1	2.84	4.3
12			2.77	3.8	2.94	5.2	3.46	12.0	2.84	4.3
13			2.75	3.7	2.94	5.2	3.29	9.5	2.88	4.6
14	3.25	18.0	2.77	3.8	2.94	5.2	3.21	8.3	2.92	5.0
15	3.23	17.1	2.75	3.7	3.02	6.0	3.12	7.0	2.92	5.0
16	3.17	14.8	2.75	3.7	3.02	6.0	3.04	6.2	2.88	4.6
17	3.12	13.1	2.75	3.7	3.21	8.3	3.00	5.8	2.88	4.6
18	3.12	13.1	2.75	3.7	3.14	7.3	3.00	5.8	2.84	4.3
19	3.00	9.8	2.75	3.7	3.06	6.4	3.00	5.8	2.84	4.3
20	3.00	9.8	2.75	3.7	3.00	5.8	2.92	5.0	2.84	4.3
21	2.96	8.8	2.79	3.9	2.96	5.4	2.92	5.0	2.79	3.9
22	2.92	7.7	2.92	5.0	2.94	5.2	2.92	5.0	2.75	3.7
23	2.96	5.4	2.84	4.3	2.94	5.2	2.92	5.0		
24	2.92	5.0	3.07	6.5	2.92	5.0	2.96	5.4		
25	2.90	4.8	3.28	9.3	2.90	4.8	2.96	5.4		
26	2.98	5.6	3.50	13.0	2.90	4.8	2.96	5.4		
27	2.84	4.3	3.33	10.1	2.96	5.4	2.96	5.4		
28	2.92	5.0	3.17	7.7	2.96	5.4	3.00	5.8		
29	2.88	4.6	3.00	5.8	2.96	5.4	3.00	5.8		
30	2.84	4.3	2.94	5.2	2.92	5.0	3.00	5.8		
31			2.88	4.6	3.17	7.7				
Mean discharge		8.89		4.93		5.89		5.98		4.37
Second-feet per square mile		0.601		0.333		0.398		0.404		0.295
Run-off (depth in inches on drainage area)		0.38		0.38		0.46		0.45		0.24
Maximum		18.0		13.0		8.3		12.0		5.8
Minimum		4.3		3.7		3.8		5.0		3.7
Accuracy		C		B		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Discovery Fork of American Creek below Star Gulch for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1			3.90	6.6	3.60	2.2	3.75	3.9	3.75	3.9
2			3.95	8.0	3.60	2.2	3.75	3.9	3.75	3.9
3			4.00	9.4	3.60	2.2	3.75	3.9	3.75	3.9
4			3.95	8.0	3.55	1.8	3.75	3.9	3.85	5.6
5			3.85	5.6	3.55	1.8	3.75	3.9	3.80	4.6
6			3.80	4.6	3.55	1.8	3.85	5.6	3.75	3.9
7			3.75	3.9	3.55	1.8	4.00	9.4	3.75	3.9
8			4.10	13	3.55	1.8	3.90	6.6		
9			4.00	9.4	3.50	1.4	3.85	5.6		
10			3.90	6.6	3.55	1.8	3.90	6.6		
11			3.90	6.6	3.60	2.2	4.35	26		
12			3.90	6.6	3.60	2.2	4.25	20		
13			3.85	5.6	3.65	2.7	4.00	9.4		
14			3.80	4.6	3.65	2.7	4.00	9.4		
15			3.75	3.9	3.65	2.7	3.90	6.6		
16			4.15	15	3.60	2.2	3.90	6.6		
17			3.85	5.6	3.60	2.2	3.85	5.6		
18			3.80	4.6	3.60	2.2	3.85	5.6		
19			3.75	3.9	3.60	2.2	3.90	6.6		
20			3.75	3.9	3.65	2.7	3.90	6.6		
21			3.70	3.2	4.10	13	3.90	6.6		
22	4.05	11	3.70	3.2	4.15	15	3.85	5.6		
23	3.95	8.0	3.70	3.2	3.85	5.6	3.90	6.6		
24	3.90	6.6	3.65	2.7	3.80	4.6	3.90	6.6		
25	3.90	6.6	3.95	8.0	3.80	4.6	3.85	5.6		
26	3.90	6.6	3.80	4.6	3.80	4.6	3.80	4.6		
27	3.90	6.6	3.65	2.7	3.85	5.6	3.75	3.9		
28	3.90	6.6	3.60	2.2	3.80	4.6	3.75	3.9		
29	4.45	32	3.60	2.2	3.70	3.2	3.75	3.9		
30	4.10	13	3.60	2.2	3.65	2.7	3.75	3.9		
31	4.00	9.4			3.75	3.9	3.75	3.9		
Mean discharge		10.6		5.7		3.6		6.8		4.2
Second-feet per square mile		0.716		0.385		0.243		0.460		0.284
Run-off (depth in inches on drainage area)		0.27		0.43		0.28		0.53		0.07
Maximum		32		15		15		26		5.6
Minimum		6.6		2.2		1.4		3.9		3.9
Accuracy		C		C		C		C		C

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Mission Creek drainage basin in 1910–1912:

Miscellaneous measurements in Mission Creek drainage basin, 1910–1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
June 27, 1911	Mission Creek	Yukon River	Above Excelsior Creek	89.8	93.1	0.96
June 21, 1912	do	do	do	89.8	93.1	.96
Sept. 4, 1912	do	do	do	68.9	93.1	.74
July 2, 1911	do	do	Below Excelsior Creek.	66.2	124	.53
Aug. 13, 1911	do	do	do	100	124	.81
June 13, 1910	do	do	Above American Creek	225	168	1.34
July 31, 1911	do	do	do	107	168	.64
June 23, 1910	Excelsior Creek	Mission Creek	At mouth	33	31.1	1.06
Aug. 29, 1910	do	do	do	23	31.1	.74
Sept. 8, 1910	do	do	do	43	31.1	1.38
June 27, 1911	do	do	do	20.0	31.1	.64
June 21, 1912	do	do	do	16.2	31.1	.52
Sept. 4, 1912	do	do	do	17.2	31.1	.55
Aug. 29, 1910	Wolf Creek	do	do	12.0	28.4	.42
Sept. 8, 1910	do	do	do	20	28.4	.70
June 27, 1911	do	do	do	7.50	28.4	.26
June 21, 1912	do	do	do	10.8	28.4	.38
Sept. 4, 1912	do	do	do	9.7	28.4	.34

SEVENTYMILE RIVER DRAINAGE BASIN.

DESCRIPTION.

Seventymile River drains an area of about 700 square miles, practically three-fourths of which lies on the south side of the stream. The headwaters of the main river are in the high rugged divide separating the basins of Seventymile and Charley rivers. Seventymile River drains the eastern slope of this divide and flows eastward for about 60 miles to a point 4 miles from its mouth, where it makes a right-angle turn and flows northward, joining the Yukon about 20 miles below Eagle.

The principal southern tributaries of Seventymile River, beginning at its headwaters, are Diamond Fork, Flume, Alder, Deep, Nugget, Granite, Green, Sonickson, Mogul, and Bryant creeks. Of these streams Granite and Mogul creeks furnish a steady supply of water to the main river. Both creeks have a heavy fall, but no workable placers have yet been found on them. The heavy timber on Mogul Creek has supplied some large saw logs to the district. The tributaries of the Seventymile from the north are small short streams, usually falling to a minimum as soon as the snow leaves the ridges. They are Barney, Washington, Broken Neck, Crooked, and Fox creeks—all containing workable placers of low grade.

Daily gage height, in feet, and discharge, in second-feet, of Seventymile River above Flume Creek for 1910 and 1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1								
2								
3								
4								
5								
6								
7								
8							0.80	116
9								
10								
11								
12								
13								
14								
15								
16								
17								
18					1.70	188		
19								
20								
21								
22								
23								
24								
25	1.30	156						
26								
27								
28			1.85	201				
29								
30					1.00	132		

SEVENTYMILE RIVER AT THE FALLS.

A gaging station was established on Seventymile River, about one-fourth mile above the falls and about 25 miles above its confluence with the Yukon, on June 16, 1910. It was maintained at the same point through 1910, 1911, and 1912. All measurements were obtained by wading. Unfortunately it was impossible to obtain gage-height observations during the highest water of the three years, August 1 to 19, 1912. On August 7 the water was reported to be over the top of the gage, which was graduated to 10 feet, and the marks on the banks indicated that the highest stage was between 10 and 11 feet. The discharge for the period of missing gage heights were estimated by comparison of the Seventymile record with the combined records of Flume, Alder, Washington, and Crooked creeks. It is thought that considerable reliance may be placed on these estimated discharges.

The large run-off of the Seventymile as compared with that of many other streams in the Yukon-Tanana region is notable. The Seventymile heads in high rugged mountains, which spill quickly and in which the precipitation is probably somewhat higher than that of lower-lying areas. The maximum discharge during the time of the records occurred August 7, 1912, and is estimated as above 9,110 second-feet. It is reported from fairly reliable sources that at one time some years ago the river reached a stage about 2 feet higher than in 1912, indicating a discharge of approximately 12,000 second-feet. The minimum summer discharge occurred August 7 and 8, 1911, when it fell to 110 second-feet.

Discharge measurements of Seventymile River at the falls, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
June 16	4.07	690	Aug. 6	2.25	117
22	4.15	710	11	3.75	694
July 23	3.35	336			
Aug. 30	3.30	288	1912.		
Sept. 2	3.70	481	June 23	3.55	565
3	4.57	1,030	July 24	4.55	1,270
			25	4.15	882
1911.			Sept. 6	3.20	379
June 26	3.70	626			
July 1	3.20	361			

Daily gage height, in feet, and discharge, in second-feet, of Seventymile River at the falls for 1910–1912.

[Drainage area, 465 square miles. Observer, Charles Martin.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			3.35	322	3.95	602	3.20	275
2			3.55	400	3.85	548	4.20	760
3			3.13	258	3.45	360	4.55	1,020
4			3.50	380	3.25	290	4.45	938
5			3.80	520	3.18	270	4.30	830
6			3.35	322	3.00	225	4.35	865
7			3.70	465	2.90	208	4.30	830
8			2.90	208	7.50	4,860	3.90	575
9				210	7.60	5,020	3.90	575
10				300	5.15	1,550	4.10	695
11				650	4.35	865	3.90	575
12				1,100	3.92	586	3.80	520
13				1,350	4.50	975	3.70	465
14			3.50	380		680	3.98	619
15			3.30	305	3.50	380	5.20	1,600
16	4.05	662	3.40	340	3.63	434	4.80	1,230
17	5.70	2,250	3.15	262	3.60	420	4.60	1,060
18	5.80	2,400	3.25	290	3.75	492	4.35	865
19	4.45	938	3.60	420	4.00	630	4.05	662
20	4.55	1,020	3.25	290	3.70	465	3.80	520
21	4.10	695	3.15	262		400		440
22	4.20	760	3.50	380	3.40	340	3.45	360
23	4.30	830	3.30	305	3.20	275	3.45	360
24	3.90	575	3.30	305	3.20	275	3.47	368
25	3.55	400	3.25	290	3.15	262	3.50	380
26	3.55	400	3.15	262	3.18	270	3.45	360
27	3.40	340	2.98	222		360	3.45	360
28	4.30	830	2.90	208	3.68	456	3.02	230
29	3.80	520	3.10	250	3.40	340	3.00	225
30		420	2.99	223	3.30	305	3.00	225
31			4.50	975	3.22	281		
Mean discharge		869		402		756		626
Second-feet per square mile		1.87		0.865		1.63		1.35
Run-off (depth in inches on drainage area)		1.04		1.00		1.88		1.51
Maximum		2,400		1,350		5,020		1,600
Minimum		340		208		208		225
Accuracy		B		A		B		A

Daily gage height, in feet, and discharge, in second-feet, of Seventymile River at the falls for 1910-1912—Continued.

Date.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1			3.18	354	2.60	190	2.70	220
2			2.98	304	2.48	166	2.68	214
3			3.10	340	2.40	150	2.60	190
4			3.50	500	2.38	146	2.50	170
5			3.25	390	2.32	134	2.48	166
6			4.85	1,550	2.25	120	2.42	154
7			4.12	906	2.20	110	2.38	146
8			3.55	525	2.20	110	2.32	134
9			3.10	340	2.32	134	2.30	130
10			2.80	250	2.40	150	2.38	146
11			2.62	196	3.35	430	3.00	310
12			2.50	170	3.22	378	3.38	442
13			2.42	154	2.90	280	3.28	402
14			2.90	280	2.90	280	3.10	340
15			2.90	280	3.65	580	3.02	316
16			2.55	180	4.40	1,130	2.92	286
17			2.50	170	3.80	670	2.82	256
18			2.40	150	3.95	775	2.75	235
19			2.32	134	3.72	622	2.60	190
20	4.15	930	2.30	130	3.45	475		180
21	4.30	1,050	2.40	150	3.12	346	2.50	170
22	4.08	874	3.40	450	2.98	304		170
23	4.10	890	3.00	310	2.88	274	2.50	170
24	4.08	874	2.55	180	2.75	235		170
25	3.90	740	2.85	265	2.62	196	2.50	170
26	3.95	775	2.85	265	2.52	174		
27	3.70	610	3.40	450	2.55	180		
28	3.52	510	3.38	442	2.62	196		
29	3.38	442	3.20	370	2.60	190		
30	3.30	410	2.88	254	2.50	170		
31			2.72	226	2.60	190		
Mean discharge		737		344		306		219
Second-feet per square mile		1.58		0.739		0.659		0.471
Run-off (depth in inches on drainage area)		0.64		0.85		0.76		0.43
Maximum		1,050		1,550		1,130		442
Minimum		410		130		110		130
Accuracy		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Seventymile River at the falls for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1			3.50	528	2.70	214		642	3.20	376	3.00	300
2			3.60	584	2.75	227		737	3.20	376	3.00	300
3	3.10	336	3.60	584	3.60	584		622	3.20	376	3.10	336
4	3.10	336	3.05	318	3.25	399		473	3.20	376	3.00	300
5	3.00	300	2.70	214	2.90	268		392	3.20	376	3.00	300
6	2.90	268	2.50	168	2.65	202		486	3.20	376	3.00	300
7	2.85	254	2.40	148	2.50	168		8,150	3.20	376	3.00	300
8	2.85	254	2.60	190	2.50	168		2,980	3.20	376	3.00	300
9	3.10	336	3.25	399	2.40	148		1,930	3.10	336	3.00	300
10	3.05	318	3.65	612	2.40	148		1,440	3.10	336	3.00	300
11	2.95	284	3.50	528	2.70	214		4,170	3.10	336	3.00	300
12	3.00	300	5.00	1,670	3.20	376		2,780	3.10	336	3.00	300
13	3.15	356	4.65	1,300	3.00	300		1,450	3.10	336	3.00	300
14	3.40	474	4.90	1,560	2.85	254		912	3.00	300	3.00	300
15	3.10	336	4.50	1,170	3.10	336		635	3.00	300	3.00	300
16	3.10	336	4.50	1,170	2.75	227		629	3.00	300	3.00	300
17	3.25	399	3.85	727	2.60	190		541	3.00	300	3.00	300
18	3.15	356	3.60	584	2.75	227		527	3.10	336	3.00	300
19	3.05	318	3.50	528	2.80	240		777	3.10	336		
20	3.00	300	3.40	474	2.70	214	3.70	640	3.00	300		
21	3.10	336	3.35	448	6.25	3,400	3.50	528	3.00	300		
22	3.30	422	3.80	698	5.35	2,100	3.40	474	3.00	300		
23	3.40	474	3.40	474	4.60	1,250	3.40	474	3.00	300		
24	3.55	556	3.35	448	4.65	1,300	3.80	698	3.00	300		
25	2.90	268	3.40	474	4.30	1,020	3.80	698	3.00	300		
26	3.00	300	3.70	640	3.95	786	3.50	528	3.00	300		
27	3.10	336	3.70	640	4.00	816	3.40	474	3.00	300		
28	3.30	422	3.15	356	3.65	612	3.40	474	3.00	300		
29	4.90	1,560	2.80	240	3.40	474	3.30	422	3.00	300		
30	4.60	1,250	2.70	214	3.30	422	3.20	376	3.00	300		
31	4.00	816			3.40	474	3.20	376				
Mean discharge		435		603		573		1,180		329		302
Second-feet per square mile		0.935		1.30		1.23		2.54		0.708		0.650
Run-off (depth in inches on drainage area)		1.01		1.45		1.42		2.93		0.79		0.44
Maximum		1,560		1,670		3,400		8,150		376		336
Minimum		254		148		148		376		300		300
Accuracy		A		A		B		B		A		A

FLUME CREEK ONE-FOURTH MILE ABOVE MOUTH.

A station was maintained on Flume Creek about one-fourth mile above its confluence with Seventymile River during three seasons. In 1910 gage-height observations were continuous over most of the season, but in 1911 and 1912 the records are very incomplete. The ratings are fairly well defined and the discharges are believed to be reasonably accurate. During 1910 a mining ditch diverted water around this station. Three miscellaneous measurements were made in this ditch, the results of which are given elsewhere. They indicate that the true daily discharge of Flume Creek is about 2.5 second-feet greater than the amounts given in the tables.

Discharge measurements of Flume Creek one-fourth mile above mouth, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
June 19	2.46	66.6	June 23	1.95	52.2
20	2.56	77.0	Aug. 8	1.35	9.45
July 20	2.09	31.2			
21	2.01	24.4	1912.		
Sept. 4	2.18	61.0	May 26	1.62	19.5
5	2.23	64.2	June 25	1.85	33.8
			July 21	3.60	*a* 436
			22	2.80	174
			Sept. 8	1.91	31.4

a Measurement made by means of floats.

Daily gage height, in feet, and discharge, in second-feet, of Flume Creek one-fourth mile above mouth for 1910–1912.

[Drainage area, 36.7 square miles. Observers: E. A. Robertson, 1910–11; E. D. Madison, 1912.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			1.95	20	2.65	86	1.92	18.4
2			1.98	23	2.28	49	2.16	37
3			1.90	17.0	2.10	32	2.42	63
4			1.87	15.6	2.01	25	2.40	61
5			2.13	35	1.96	21	2.38	59
6			2.02	26	1.89	16.5	2.32	53
7			1.94	19.8	1.84	14.2	2.20	41
8			1.84	14.2	3.60	191	2.14	36
9			1.86	15.1	3.48	178	2.10	32
10			1.78	11.7	2.80	103	2.18	39
11			1.79	12.0	2.39	60	2.18	39
12			2.86	110	2.31	52	2.06	29
13			1.98	23	2.18	39	2.04	27
14			1.82	13.2	2.12	34	2.12	34
15			1.91	17.7	2.12	34	2.72	94
16			2.18	39	2.15	36	2.60	81
17			2.04	27	2.12	34	2.44	65
18			2.28	49	2.12	34	2.32	53
19	2.46	67	2.34	55	2.18	39	2.22	43
20	2.64	85	2.12	34	2.10	32	2.15	36
21	2.44	65	2.01	25	2.00	24		33
22	2.48	69	2.02	26	1.90	17.0		30
23	2.47	68	1.94	19.8	1.88	16.1		27
24	2.25	46	1.89	16.5	1.84	14.2	1.98	23
25	2.00	24	1.88	16.1	1.82	13.2	1.96	21
26	2.10	32	1.85	14.6	1.85	14.6	1.96	21
27	2.02	26	1.82	13.2	1.88	16.1	1.95	20
28	2.30	51	1.79	12.0	1.85	14.6		
29	2.17	38	1.85	14.6	1.85	14.6		
20	2.02	26	1.90	17.0	1.96	21		
31			2.89	113	1.92	18.4		
Mean discharge		49.8		27.9		41.7		41.3
Second-feet per square mile		1.36		0.760		1.14		1.13
Run-off (depth in inches on drainage area)		0.61		0.88		1.31		1.13
Maximum		85		113		191		94
Minimum		24		11.7		13.2		18.4
Accuracy		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Flume Creek one-fourth mile above mouth for 1910–1912—Continued.

Day.	June.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.
1911.				
1				
2				
3				
4				
5				
6				
7				
8			1.35	9.4
9				
10				
11				
12				
13				
14				
15				
1911—Con.				
16				
17				
18				
19				
20			1.75	25
21			1.72	24
22			1.71	23
23	1.95	52	1.70	23
24			1.61	19
25			1.52	16
26			1.46	13
27			1.50	15
28				
29				
30				
31				

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1							2.10	48		30
2							2.15	53		30
3							2.00	40		30
4							1.90	33		33
5							1.80	27		33
6							1.90	33		33
7							4.35	735		33
8							3.15	280	1.90	33
9								190		
10							2.50	98		
11							3.45	379		
12							3.10	264		
13							2.60	120		
14							2.30	68		
15							2.00	40		
16							2.05	44		
17							2.00	40		
18							1.95	36		
19							2.10	48		
20							2.00	40		
21					3.50	396	1.90	33		
22					2.80	174	1.90	33		
23					2.70	146	1.85	30		
24					2.65	133	2.00	40		
25			1.85	30	2.30	68	2.00	40		
26	1.60	19			2.10	48	2.00	40		
27					1.95	36	1.90	33		
28					1.85	30	1.90	33		
29					1.85	30	1.85	30		
30					1.90	33	1.85	30		
31					2.00	40		30		
Mean discharge						103		96.4		31.9
Second-feet per square mile						2.80		2.63		0.869
Run-off (depth in inches on drainage area)						1.14		3.03		0.26
Maximum						396		735		33
Minimum						30		30		30
Accuracy						B		B		B

ALDER CREEK AT CLAIM "NO. 7 ABOVE."

This station is located at claim "No. 7 above," on Alder Creek, about 1½ miles from its mouth. A gage was installed June 20, 1910, and records were obtained for three seasons. The records are continuous and accurate and should be of value for showing the streamflow characteristics of this region. The maximum discharge at this station was 162 second-feet, on August 7, 1912; the minimum was 2.5 second-feet, on May 10, 1912, but perhaps it was too early in the season to represent normal summer conditions. A discharge of 3.8 second-feet occurred on July 8, 9, and 19, 1912.

Discharge measurements of Alder Creek at claim "No. 7 above," 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 20	2.73	24	May 27	2.24	6.2
21	2.60	14.6	June 24	2.55	14.2
July 19	2.67	19.2	July 22	3.05	51.4
20	2.41	9.4	23	2.81	30
Sept. 5	3.00	36	Sept. 7	2.21	9.66
6	2.88	31			
1911.					
June 22	2.41	10.7			
24	2.35	8.67			
Aug. 7	2.00	5.59			

Daily gage height, in feet, and discharge, in second-feet, of Alder Creek at claim "No. 7 above" for 1910–1912.

[Drainage area, 11.8 square miles. Observer, James Murphy.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.										
1			2.42	9.8	2.58	15.2	2.35	8.2	2.32	7.7
2			2.42	9.8	2.48	11.5	2.55	14	2.28	7.1
3			2.40	9.2	2.45	10.6	2.77	24	2.32	7.7
4			2.58	15.2	2.40	9.2	2.78	25	2.30	7.3
5			2.52	12.9	2.40	9.2	2.88	31	2.25	6.7
6			2.45	10.6	2.35	8.2	2.85	29		
7			2.42	9.8	2.35	8.2	2.65	18.5		
8			2.40	9.2	3.10	45	2.58	15.2		
9			2.40	9.2	3.45	70	2.48	11.5		
10			2.38	8.8	3.25	56	2.62	17.0		
11			2.42	9.8	2.92	33	2.52	12.9		
12			2.42	9.8	2.65	18.5	2.50	12.1		
13			2.42	9.8	2.52	12.9	2.48	11.5		
14			2.40	9.2	2.45	10.6	2.55	14.0		
15			2.40	9.2	2.45	10.6	3.25	56		
16			2.40	9.2	2.45	10.6	3.05	42		
17			2.38	8.8	2.45	10.6	2.82	27		
18			2.50	12.1	2.45	10.6	2.68	20		
19			2.52	12.9	2.42	9.8	2.52	12.9		
20	2.75	24	2.42	9.8	2.40	9.2	2.40	9.2		
21	2.52	12.9	2.48	11.5	2.40	9.2	2.45	10.6		
22	2.55	14.0	2.45	10.6	2.40	9.2	2.35	8.2		
23	2.52	12.9	2.42	9.8	2.38	8.8	2.30	7.3		
24	2.48	11.5	2.42	9.8	2.35	8.2	2.30	7.3		
25	2.48	11.5	2.42	9.8	2.35	8.2		7.3		
26	2.45	10.6	2.42	9.8	2.35	8.2		7.3		
27	2.45	10.6	2.38	8.8	2.35	8.2	2.30	7.3		
28	2.50	12.1	2.40	9.2	2.42	9.8		7.9		
29	2.42	9.8	2.35	8.2	2.40	9.2		8.5		
30	2.40	9.2	2.38	8.8	2.40	9.2	2.40	9.2		
31			2.90	32	2.35	8.2				
Mean discharge		12.6		10.8		15.4		16.4		7.3
Second-feet per square mile		1.07		0.915		1.31		1.39		0.619
Run-off (depth in inches on drainage area)		0.44		1.05		1.51		1.55		0.12
Maximum		24		32		70		56		7.7
Minimum		9.2		8.2		8.2		7.3		6.7
Accuracy		B		B		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Alder Creek at claim "No. 7 above" for 1910-1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.												
1			2.75	24	2.18	6.9	2.08	6.1	2.30	8.3	2.05	5.9
2			2.85	29	2.20	7.1	2.02	5.7	2.50	12.1	2.00	5.5
3			3.05	44	2.20	7.1	2.08	6.1	2.25	7.7	2.00	5.5
4			3.12	46	2.30	8.3	2.05	5.9	2.00	5.5	2.00	5.5
5			3.10	45	3.20	52	2.00	5.5	2.25	7.7	2.00	5.5
6	2.30	8.3	3.00	38	2.48	11.7	2.00	5.5	1.98	5.3	1.95	5.1
7	2.50	12.1	2.85	29	2.35	9.2	2.00	5.5	1.95	5.1	1.95	5.1
8	2.52	12.9	2.75	24	2.30	8.3	1.95	5.1	1.90	4.7	1.85	4.3
9	2.45	11.1	2.70	21	2.22	7.3	2.00	5.5	1.95	5.1		
10	2.40	10.0	2.58	15.2	2.18	6.1	2.15	6.7	2.05	5.9		
11	2.35	9.2	2.55	14.1	2.30	8.3	2.25	7.7	2.25	7.7		
12	2.25	7.7	2.65	18.5	2.30	8.3	2.12	6.5	2.32	8.6		
13	2.30	8.3	2.68	20	2.25	7.7	2.20	7.1	2.30	8.3		
14	2.45	11.1	2.68	20	2.50	12.1	2.55	14.1	2.25	7.7		
15	2.45	11.1	2.75	24	2.50	12.1	2.50	12.1	2.20	7.1		
16	2.40	10	2.75	24	2.05	5.9	2.52	12.9	2.20	7.1		
17	2.42	10	2.70	21	2.30	8.3	2.55	14.1	2.20	7.1		
18	2.60	16	2.65	18.5	2.25	7.7	2.38	9.6	2.15	6.7		
19	2.72	22	2.75	24	2.30	8.3	2.40	10	2.22	7.3		
20	2.68	20	2.58	15.2	2.00	5.5	2.35	9.2	2.20	7.1		
21	2.52	12.9	2.50	12.1	2.35	9.2	2.30	8.3	2.15	6.7		
22	2.40	10.0	2.42	10.4	2.22	7.3	2.20	7.1	2.05	5.9		
23	2.38	9.7	2.50	12.1	2.10	6.3	2.15	6.7	2.15	6.7		
24	2.30	8.3	2.42	10.4	2.08	6.1	2.30	8.3	2.18	6.9		
25	2.58	15.2	2.40	10	2.05	5.9	2.30	8.3	2.10	6.3		
26	2.92	33	2.38	9.7	2.28	8.1	2.50	12.1	2.12	6.5		
27	2.88	21	2.32	8.6	2.42	10.4	2.00	5.5	2.10	6.3		
28	2.62	17	2.30	8.3	2.48	11.7	2.00	5.5	2.12	6.5		
29	2.52	12.9	2.28	8.1	2.40	10	2.25	7.7	2.10	6.3		
30	2.95	35	2.22	7.3	2.25	7.7	2.00	5.5	2.05	5.9		
31	3.20	52			2.18	6.9	2.30	8.3				
Mean discharge		15.7		20.4		9.61		7.88		6.87		5.30
Second-feet per square mile		1.33		1.73		0.814		0.668		0.582		0.449
Run-off (depth in inches on drainage area)		1.28		1.93		0.94		0.77		0.65		0.14
Maximum		52		46		52		14.1		12.1		5.9
Minimum		7.7		7.3		5.5		5.1		4.7		4.3
Accuracy		B		B		B		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Alder Creek at claim "No. 7 above" for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1	......	......	2.50	12	2.20	5.5	2.75	26	2.18	9.3	2.10	7.3
2	......	......	2.62	17	2.28	7.1	2.75	26	2.25	11	2.15	8.6
3	......	......	2.52	13	2.40	9.5	2.60	16	2.30	12	2.20	9.8
4	......	......	2.32	7.9	2.35	8.5	2.50	12	2.30	12	2.10	7.3
5	......	......	2.22	5.9	2.28	7.1	2.40	9.5	2.30	12	2.15	8.6
6	......	......	2.18	5.2	2.20	5.5	2.48	12	2.25	11	2.10	7.3
7	......	......	2.12	4.1	2.12	4.1	4.00	162	2.20	9.8	2.10	7.3
8	......	......	2.40	9.5	2.10	3.8	3.10	76	......	10	2.10	7.3
9	2.50	12	2.60	16	2.10	3.8	2.75	42	......	10	2.08	6.9
10	2.00	2.5	2.60	16	2.50	12	2.58	28	2.25	11	2.05	6.3
11	2.05	3.2	2.70	22	2.50	12	3.20	88	2.20	9.8	2.00	5.3
12	2.10	3.8	3.35	82	2.40	9.5	3.00	66	2.30	12	2.05	6.3
13	2.18	5.2	2.95	42	2.30	7.5	2.72	40	2.28	12	2.05	6.3
14	2.25	6.5	2.82	32	2.28	7.1	2.58	28	2.20	9.8	2.02	5.7
15	2.18	5.2	2.80	30	2.20	5.5	2.50	22	2.20	9.8	......	......
16	2.30	7.5	2.68	21	2.18	5.2	2.48	21	2.20	9.8	......	......
17	2.25	6.5	2.52	13	2.18	5.2	2.42	17	2.20	9.8	......	......
18	2.32	7.9	2.42	10	2.15	4.6	2.40	16	2.20	9.8	......	......
19	2.18	5.2	2.38	9.1	2.10	3.8	2.38	15	2.20	9.8	......	......
20	2.20	5.5	2.32	7.9	2.15	4.6	2.32	13	2.15	8.6	......	......
21	2.25	6.5	2.28	7.1	3.75	130	2.30	12	2.18	9.3	......	......
22	2.30	7.5	2.32	7.9	3.30	76	2.25	11	2.20	9.8	......	......
23	2.38	9.1	2.45	11	2.90	38	2.25	11	2.20	9.8	......	......
24	2.22	5.9	2.52	13	2.95	42	2.42	17	2.10	7.3	......	......
25	2.22	5.9	2.52	13	2.72	24	......	16	2.05	6.3	......	......
26	2.20	5.5	2.58	15	2.60	16	......	14	2.10	7.3	......	......
27	2.28	7.1	2.55	14	2.48	12	......	12	2.15	8.6	......	......
28	2.40	9.5	2.40	9.5	2.40	9.5	......	12	2.10	7.3	......	......
29	3.00	47	2.28	7.1	2.38	9.1	......	10	2.08	6.9	......	......
30	2.82	32	2.22	5.9	2.35	8.5	......	10	2.10	7.3	......	......
31	2.55	14	......	......	2.60	16	......	10	......	......	......	......
Mean discharge	......	9.61	......	16.0	......	16.5	......	24.9	......	9.64	......	7.16
Second-feet per square mile	......	0.814	......	1.36	......	1.40	......	2.11	......	0.816	......	0.607
Run-off (depth in inches on drainage area)	......	0.70	......	1.52	......	1.61	......	2.43	......	0.91	......	0.32
Maximum	......	47	......	82	......	130	......	162	......	12	......	9.8
Minimum	......	2.5	......	4.1	......	3.8	......	9.5	......	6.3	......	5.3
Accuracy	......	B	......	B	......	B	......	B	......	B	......	B

BARNEY CREEK ABOVE DITCH INTAKE.

A station was established on the right fork of Barney Creek, above the ditch intake and about 2 miles from the mouth, on June 18, 1910. During the season sufficient gage readings were obtained to make estimates of the daily discharge.

Discharge measurements of Barney Creek above ditch intake, 1910–11.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1910—Continued.	*Feet.*	*Sec.-ft.*
June 18	1.94	2.60	Sept. 2	1.83	2.20
21	1.72	.69	6	1.85	2.60
July 22	1.71	.72			
Aug. 31	1.70	.89	1911.		
Sept. 1	1.72	1.10	Aug. 9	1.20	[a] .45

[a] Estimated.

Daily gage height, in feet, and discharge, in second-feet, of Barney Creek above ditch intake for 1910.

[Observer, John Williams.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.70	0.6		0.8	1.72	1.1
2				.6		.7		4.1
3				.6		.6	2.00	7.1
4			1.70	.6		.5		6.7
5			1.95	2.8	1.60	.4		6.2
6			1.80	1.2		.4		5.7
7				1.0		1.0		5.2
8				.8	2.00	3.5		4.7
9			1.70	.6	2.40	13.4		4.2
10				.6	2.10	11.7	1.90	3.7
11			1.70	.6	1.90	3.7		
12				.7	1.80	1.8		
13				.8	1.80	1.8		
14				.9		1.5		
15				.8		1.2		
16				.6	1.70	.9		
17			1.70	.6		1.2		
18	1.95	2.8		.6		1.5		
19		2.0	1.70	.6	1.80	1.8		
20	1.75	.9	1.65	.4		1.5		
21	1.75	.9		.5		1.2		
22	1.70	.6	1.70	.6		.9		
23		.5	1.70	.6		.9		
24	1.65	.4		.6		.9		
25		.4	1.70	.6	1.70	.9		
26		.5	1.70	.6		.9		
27	1.70	.6		.6		.9		
28	1.80	1.2		.6		.9		
29	1.80	1.2		.7		.9		
30	1.80	1.2		.8		.9		
31			1.75	.9	1.70	.9		
Mean discharge		1.02		0.745		1.94		4.87
Accuracy		C		C		C		C

BARNEY CREEK DITCH BELOW THE FORKS.

On August 11, 1911, a gage was installed on Barney Creek ditch below the forks. Ditches divert from both forks of Barney Creek and unite a short distance below their intakes in a single ditch which at ordinary stages carries all the water Barney Creek can supply. Gage-height records were obtained during 1912. The daily discharges represent the total flow of both forks for the greater part of the summer.

Discharge measurements of Barney Creek ditch below the forks, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912—Continued.	*Feet.*	*Sec.-ft.*
Aug. 11	2.05	3.46	May 29	2.00	3.02
			29	1.75	1.06
1912.			June 26	2.00	3.18
May 25	1.61	.20	Sept. 6	1.80	1.95

Daily gage height, in feet, and discharge, in second-feet, of Barney Creek ditch below the forks for 1912.

[Observer, A. H. Turnbull.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.20	5.1	1.60	0.3	1.70	0.7		1.4
2			2.20	5.1	1.60	.3	1.69	.7		1.4
3			2.16	4.7	1.60	.3	1.68	.6		1.4
4			2.00	3.1	1.61	.3	1.65	.5		1.4
5			2.00	3.1	1.62	.4	1.61	.3		1.4
6			2.10	4.1	1.60	.3	2.00	3.1	1.80	1.4
7			2.10	4.1	1.56	.2	2.45	7.9		
8			2.00	3.1	1.60	.3	2.31	6.2		
9			2.00	3.1	1.65	.5	2.30	6.1		
10			1.90	2.2	1.70	.7	2.20	5.1		
11			1.90	2.2	1.80	1.4	2.10	4.1		
12			1.80	1.4	1.90	2.2	2.01	3.2		
13			1.80	1.4	1.90	2.2	2.00	3.1		
14			1.80	1.4	1.87	2.0	2.00	3.1		
15			1.70	.7	1.81	1.5	1.98	2.9		
16			1.62	.4	1.80	1.4	1.90	2.2		
17			1.60	.3	1.75	1.0	1.90	2.2		
18			1.65	.5	1.71	.8	1.95	2.6		
19			2.00	3.1	1.67	.6	2.00	3.1		
20			2.00	3.1	1.70	.7	2.10	4.1		
21			2.10	4.1	2.35	6.7	2.00	3.1		
22			2.12	4.3	2.30	6.1	2.00	3.1		
23			1.61	.3	2.25	5.6	2.00	3.1		
24			1.60	.3	2.20	5.1	1.95	2.6		
25	1.61	0.3	1.63	.4	2.01	3.2	1.93	2.5		
26	1.60	.3	1.80	1.4	2.00	3.1	1.92	2.4		
27	1.59	.3	2.20	5.1	2.00	3.1	1.90	2.2		
28	1.60	.3	2.10	4.1	1.90	2.2	1.85	1.8		
29	1.80	1.4	1.90	2.2	1.85	1.8	1.83	1.6		
30	2.20	5.1	1.60	.3	1.80	1.4	1.82	1.6		
31	2.15	4.6			1.72	.8	1.80	1.4		
Mean discharge.		1.76		2.49		1.82		2.81		1.4
Accuracy		B		B		B		B		B

SONICKSON CREEK ABOVE DITCH INTAKE.

A station was established on Sonickson Creek above the ditch intake, about a mile from its mouth, on June 16, 1910. In June, 1911, the gage was relocated at a point at which it remained through 1912. Gage-height observations were occasionally obtained for the three seasons. In 1910 the daily discharges are estimated for the season, but in 1911 and 1912 the discharges are given only for those days on which the gage heights were reported.

In 1909 a ditch was built for diverting water from Sonickson Creek for use in mining the benches on the right limit of the Seventymile just above the falls. The ditch is about 8,000 feet long and has a bottom width of 3 feet and a grade of 4.6 feet per mile. A pressure of 100 to 150 feet is available at the point of operation. The ditch was used successfully until the summer of 1912, when it was abandoned, owing to the discouraging conditions which were encountered in mining the benches.

Discharge measurements of Sonickson Creek above ditch intake, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 16	1.87	8.8	May 24	2.87	5.13
18	2.62	66	30	3.43	27.4
22	1.87	9.1	June 23	3.05	7.54
July 23	2.13	19.2	Sept. 10	3.07	7.63
Aug. 30	1.90	9.0			
Sept. 3	2.48	45			
1911.					
June 26	2.82	6.94			
July 1	2.67	4.56			
Aug. 11	3.28	14.8			

Daily gage height, in feet, and discharge, in second-feet, of Sonickson Creek above ditch intake for 1910–1912.

[Drainage area, 12.6 square miles. Observer, Charles Martin.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			1.60	4.0	1.75	6.2	1.92	10.2
2			1.57	3.7		5.8	2.30	30
3			1.53	3.3		5.4	2.52	51
4			1.50	3.0		5.0		42
5			1.49	2.9		4.5	2.35	34
6			1.48	2.8	1.60	4.0		30
7			1.47	2.7		5.5	2.25	26
8			1.45	2.5	1.79	7.0		26
9				2.5	3.35	192	2.25	26
10				2.5	2.55	55		24
11				3.2	2.35	34		21
12				3.9	2.10	17.7		19
13				4.6	2.00	13.0	2.10	17.7
14			1.70	5.3	1.95	11.2	2.15	20
15			1.68	5.0		10.7		26
16	1.87	8.8		4.5	1.92	10.2		32
17	3.90	310	1.60	4.0	1.92	10.2	2.40	39
18	2.60	61	1.65	4.6	1.93	10.6		
19	2.15	20	1.92	10.2		10.0		
20	2.10	17.7	1.83	7.9	1.90	9.5		
21	1.90	9.5	1.75	6.2		8.7		
22	1.90	9.5		12.8		7.9		
23	1.85	8.4	2.13	19.3	1.80	7.2		
24	1.75	6.2	2.02	13.9	1.85	8.4		
25	1.70	5.3		12.8		8.4		
26	1.67	4.9		6.2	1.85	8.4		
27	1.78	6.8		5.8	1.88	9.0		
28		5.7		5.4		10.1		
29	1.65	4.6	1.68	5.0	1.95	11.2		
30		4.3		5.4	1.90	9.5		
31			1.73	5.9		9.8		
Mean discharge		32.2		5.86		17.0		27.9
Second-feet per square mile		2.56		0.465		1.35		2.21
Run-off (depth in inches on drainage area)		1.43		0.536		1.56		1.40
Maximum		310		19.3		192		51
Minimum		4.3		2.5		4.0		10.2
Accuracy		C		B		C		B

Daily gage height, in feet, and discharge, in second-feet, of Sonickson Creek above ditch intake for 1910–1912—Continued.

Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.	Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.
1911.							1911—Con.						
1	2.62	4.0	2.85	7.1			16			3.50	17.3		
2	2.65	4.4					17	2.65	4.4				
3	2.63	4.2					18	2.60	3.8			3.00	9.2
4	2.88	7.5	2.65	4.4			19	2.50	2.7				
5							20						
6							21	2.60	3.8				
7			2.60	3.8			22	2.92	8.1				
8	3.55	18.2			2.80	6.4	23	2.75	5.7				
9							24	2.90	7.8				
10							25	3.65	19.9				
11	2.60	3.8	3.30	13.9			26	3.70	21	2.90	7.8		
12					3.55	18.2	27	3.50	17.3	2.90	7.8		
13							28						
14	3.10	10.7					29						
15			3.60	19.0			30						
							31						

Day.	May. Gage height.	May. Discharge.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	September. Gage height.	September. Discharge.
1912.								
1					2.75	3.7		
2								
3			3.25	14				
4								
5					3.05	7.7		
6			2.85	4.8				
7					2.80	4.2		
8			3.10	8.6				
9								
10							3.05	7.7
11								
12			3.55	36	3.10	8.6		
13								
14								
15								
16								
17								
18					3.20	11		
19								
20								
21					4.40	135		
22			3.15	9.8				
23			3.05	7.7				
24	2.85	4.8						
25	2.80	4.2						
26								
27	2.80	4.2						
28								
29	3.75	55	3.00	6.8				
30	3.45	27						
31								

WASHINGTON CREEK ABOVE DAM.

This station was established about one-fourth mile above the mouth of Washington Creek, just above an old dam, on May 30, 1912, and was maintained through the summer season. Washington Creek in this vicinity flows through a channel which it has cut in the muck and sand, and its banks and bed are very easily eroded. During 1912 frequent shifts occurred, so that the ratings are only approximate. On September 4 a dam was constructed about one-half mile above the gage and water diverted through a slough. On September 9 a measurement of this diversion at the intake gave 3.51 second-feet. This is probably the approximate rate at which water was diverted from Washington Creek above the gaging station after September 4.

Discharge measurements of Washington Creek above dam, 1911 and 1912.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
1911.		
Aug. 11		[a] 3.53
1912.		
May 30	1.24	24.3
June 23	1.00	6.39
June 27	1.17	13.0
July 24	1.21	16.2
25	1.13	13.8
Sept. 6	.95	4.74
9	.78	2.59

[a] Measurement made at mouth.

Daily gage height, in feet, and discharge, in second-feet, of Washington Creek above dam for 1912.

[Drainage area, 15.6 square miles. Observer, John Oleson.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.90	5	0.75	0.8	0.95	5.2	1.00	6.5
2			1.40	34	1.80	51	1.10	11	1.05	8.8
3			1.00	10	1.30	21	1.10	11	1.10	11
4			1.05	13	1.10	10	1.05	8.8	1.00	6.5
5			.90	5	1.05	8.2	1.00	6.5	1.00	6.5
6			.90	5	.90	3.3	1.10	11		4.5
7			.80	5	.80	1.3	2.50	99	.80	2.5
8			1.10	16	.80	1.3	1.70	46	.80	2.5
9			1.40	34	.75	.8	1.40	28	.80	2.5
10			1.20	15	.80	1.3	1.25	19	.80	2.5
11			1.10	10	1.00	6.3	2.00	64	.80	2.5
12			1.25	18	1.00	6.3	1.50	34	.70	2.0
13			1.10	10	.95	4.8	1.35	25	.70	2.0
14			1.05	8.2	1.05	8.2	1.20	16	.70	2.0
15			1.00	6.3	1.00	6.3	1.10	11	.70	2.0
16			.90	3.3	.95	4.8	1.05	8.8	.70	2.0
17			.85	2.3	1.10	10	1.00	6.5	.70	2.0
18			.80	1.3	1.10	10	1.10	11	.70	2.0
19			.80	1.3	1.15	12	1.25	19	.70	2.0
20			.75	.8	1.10	10	1.20	16	.70	2.0
21			.80	1.3	2.50	100	1.15	14	.70	2.0
22			.90	3.3	1.40	28	1.20	16	.70	2.0
23			1.00	6.3	1.30	22	1.10	11	.70	2.0
24				8	1.20	16	1.05	8.8	.70	2.0
25				10	1.10	11	1.00	6.5	.70	2.0
26				10	1.10	11	1.10	11	.60	1.5
27			1.15	12	1.05	8.8	1.05	8.8	.60	1.5
28				8	1.00	6.5	1.00	6.5	.60	1.5
29				6	.95	5.2	1.05	8.8	.60	1.5
30	1.25	25		3	.90	4.0	1.05	8.8	.60	1.5
31	1.00	10			.90	4.0	1.00	6.5		
Mean discharge				9.0		12.7		17.7		3.1
Second-feet per square mile				0.577		0.814		1.13		0.199
Run-off (depth in inches on drainage area)				0.64		0.94		1.30		0.22
Maximum				34		100		99		11
Minimum				0.8		0.8		5.2		1.5
Accuracy				C		C		C		C

CROOKED CREEK BELOW ELDORADO CREEK.

This station was established just above Froelich & Krommer's dam, about one-fourth mile below Eldorado Creek and 2 miles above the junction of Crooked Creek with Seventymile River, on June 15, 1910, and records were obtained for three years. Settlement of the gage and channel shifts necessitated the use of different ratings each year. In 1912 unusual freshets changed the channel very materially, and for the later part of the season the rating is poorly defined.

Discharge measurements of Crooked Creek below Eldorado Creek, 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911—Continued.	*Feet.*	*Sec.-ft.*
June 15	2.61	2.7	Aug. 5	2.25	1.25
22	2.65	4.0	12	2.65	5.76
July 24	2.65	4.4	13	2.44	3.89
Aug. 30	2.65	4.1	1912.		
Sept. 2	3.35	34.0	May 23	2.42	3.40
3	3.30	30.0	23	2.48	4.79
7	2.96	14.5	June 22	2.73	11.4
1911.			July 25	3.42	17.7
June 19	2.63	7.10	Sept. 5	13.44	10.4
27	2.35	2.55			

Daily gage height, in feet, and discharge, in second-feet, of Crooked Creek below Eldorado Creek for 1910–1912.

[Drainage area, 17.2 square miles. Observer, Arthur Froelich.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			2.65	4.4	2.50	1.9	2.65	4.4
2			2.60	3.4	2.50	1.9	3.00	16.0
3			2.55	2.6	2.45	1.4	3.28	29
4			2.60	3.4	2.45	1.4	3.15	22
5			2.65	4.4	2.40	1.0	3.15	22
6			2.60	3.4	2.40	1.0	3.10	20
7			2.55	2.6	2.40	1.0	2.95	14.0
8			2.50	1.9	4.60	139	2.80	8.4
9			2.45	1.4	4.40	121	2.90	12.0
10			2.45	1.4	3.25	28	3.05	18.0
11			2.50	1.9	3.05	18.0	3.00	16.0
12			2.60	3.4	2.85	10.2	2.90	12.0
13			2.55	2.6	2.75	7.0	2.90	12.0
14			2.50	1.9	2.70	5.5	3.20	25
15	2.60	2.7	2.50	1.9	2.70	5.5	3.52	46
16	2.70	4.8	2.45	1.4	2.75	7.0	3.25	28
17	3.48	43	2.45	1.4	2.75	7.0	3.35	34
18	3.25	28	2.50	1.9	2.90	12.0	3.20	25
19	2.95	14.0	2.55	2.6	2.85	10.2	3.10	20
20	2.80	8.4	2.50	1.9	2.80	8.4	3.20	25
21	2.75	7.0	2.50	1.9	2.75	7.0		
22	2.65	4.4	2.65	4.4	2.70	5.5		
23	2.65	4.4	2.60	3.4	2.70	5.5		
24		3.5	2.65	4.4	2.70	5.5		
25	2.55	2.6	2.60	3.4	2.70	5.5		
26	2.55	2.6	2.55	2.6	2.70	5.5		
27	2.75	7.0	2.50	1.9	2.70	5.5		
28	2.75	7.0	2.45	1.4	2.70	5.5		
29	2.75	7.0	2.45	1.4	2.65	4.4		
30	2.80	8.4	2.45	1.4	2.65	4.4		
31			2.50	1.9	2.65	4.4		
Mean discharge		9.68		2.51		14.4		20.4
Second-feet per square mile		0.563		0.146		0.837		1.19
Run-off (depth in inches on drainage area)		0.34		0.17		0.96		0.88
Maximum		43		4.4		139		46
Minimum		2.6		1.4		1.0		4.4
Accuracy		A		A		B		A

Daily gage height, in feet, and discharge in second-feet, of Crooked Creek below Eldorado Creek for 1910–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1	....	....	2.30	2.0	2.35	2.7	2.45	4.2
2	....	....	2.30	2.0	2.30	2.0	2.45	4.2
3	....	....	2.70	9.5	2.30	2.0	2.45	4.2
4	....	....	2.45	4.2	2.30	2.0	2.40	3.4
5	....	....	2.40	3.4	2.25	1.5	2.40	3.4
6	....	....	2.40	3.4	....	1.5	2.40	3.4
7	....	....	2.40	2.7	....	1.5	2.35	2.7
8	....	....	2.35	2.7	....	1.5	2.35	2.7
9	....	....	2.35	2.7	2.25	1.5	2.35	2.7
10	....	....	2.30	2.0	2.35	2.7	2.35	2.7
11	....	....	2.25	1.5	2.65	8.2	2.50	5.0
12	2.75	10.8	2.25	1.5	2.50	3.4	3.30	33
13	3.55	47	2.25	1.5	2.45	4.2	3.00	20
14	3.00	20	2.25	1.5	2.45	4.2	2.80	12
15	2.85	14	2.25	1.5	3.30	33	2.70	9.5
16	2.75	10.8	2.25	1.5	3.00	20	2.60	7.0
17	2.70	9.5	2.25	1.5	3.10	24	2.55	6.0
18	2.65	8.2	2.25	1.5	2.95	18	2.55	6.0
19	2.65	8.2	2.25	1.5	2.90	16	2.55	6.0
20	2.60	7.0	2.20	1.0	2.85	14	2.60	7.0
21	2.55	6.0	2.75	10.8	2.60	7.0	....	....
22	2.50	5.0	2.55	6.0	2.55	6.0	....	....
23	2.45	4.2	2.35	2.7	2.50	5.0	....	....
24	2.40	3.4	2.35	2.7	2.45	4.2	....	....
25	2.40	3.4	2.40	3.4	2.40	3.4	....	....
26	2.40	3.4	2.70	9.5	2.40	3.4	....	....
27	2.35	2.7	2.70	9.5	....	3.4	....	....
28	2.30	2.0	2.50	5.0	....	3.4	....	....
29	2.30	2.0	2.45	4.2	....	3.4	....	....
30	2.30	2.0	2.40	3.4	2.40	3.4	....	....
31	....	....	2.35	2.7	2.45	4.2	....	....
Mean discharge	....	8.93	....	3.52	....	6.80	....	7.26
Second-feet per square mile	....	0.519	....	0.202	....	0.395	....	0.422
Run-off (depth in inches on drainage area)	....	0.37	....	0.23	....	0.46	....	0.31
Maximum	....	47	....	10.8	....	33	....	33
Minimum	....	2.0	....	1.0	....	1.5	....	2.7

Daily gage height, in feet, and discharge, in second-feet, of Crooked Creek below Eldorado Creek for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height	Discharge.	Gage height.	Discharge.
1912.										
1			2.50	5.0	2.40	3.4	3.35	16	3.45	10
2			3.10	24	2.50	5.0	3.45	19	3.45	10
3			3.10	24	2.75	10.8	3.40	17	3.40	9
4			2.70	9.5	2.55	6.0	3.35	16	3.45	10
5			2.60	7.0	2.45	4.2	3.30	14	3.45	10
6			2.50	5.0	2.40	3.4	3.35	16	3.40	9
7			2.40	3.4	2.35	2.7	5.80	208	3.40	9
8			3.05	22	2.30	2.0	4.10	38	3.40	9
9			3.45	41	2.30	2.0	3.85	26	3.45	10
10			3.15	26	2.35	2.7	3.80	23	3.40	9
11			2.85	14	2.45	4.2	4.80	86	3.40	9
12			2.90	16	2.70	9.5	4.25	47	3.40	9
13			2.85	14	2.50	5.0	3.95	30	3.35	8
14			2.70	9.5	2.65	8.2	3.80	23	3.35	8
15	2.60	7.0	2.70	9.5	2.65	8.2	3.75	21	3.35	8
16	2.55	6.0	2.85	14	2.55	6.0	3.70	19	3.40	9
17	2.50	5.0	2.70	9.5	2.65	8.2	3.65	17	3.45	10
18	2.45	4.2	2.60	7.0	2.60	7.0	3.60	15	3.50	12
19	2.45	4.2	2.55	6.0	2.55	6.0	4.00	33	3.50	12
20	2.45	4.2	2.55	6.0	2.65	8.2	3.80	23	3.45	10
21	2.40	3.4	2.55	6.0	5.05	173	3.80	23	3.45	10
22	2.40	3.4	2.70	9.5	4.00	45	3.75	21	3.45	10
23	2.45	3.4	2.65	8.2	3.65	27	3.65	17	3.40	9
24	2.40	3.4	2.60	7.0	3.55	23	3.65	17		
25	2.35	2.7	2.75	10.8	3.40	17	3.60	15		
26	2.35	2.7	3.05	22	3.50	21	3.60	15		
27	2.35	2.7	2.80	12	3.40	17	3.55	14		
28	2.35	2.7	2.60	7.0	3.35	16	3.55	14		
29	3.05	22	2.50	5.0	3.40	17	3.50	12		
30	2.85	14	2.45	4.2	3.35	16	3.50	12		
31	2.60	7.0			3.30	14	3.45	10		
Mean discharge		5.77		12.1		16.0		28.3		9.52
Second-feet per square mile		0.335		0.704		0.930		1.65		0.553
Run-off (depth in inches on drainage area)		0.21		0.79		1.07		1.90		0.47
Maximum		22		41		173		208		12
Minimum		2.7		3.4		2.0		10		8
Accuracy		B		B		C		C		B

FOX CREEK AT ROLF'S CLAIM.

This station was established on Fox Creek at Frank Rolf's mining claim, about 3 miles above the mouth of the creek and just below Lucky Gulch, on June 19, 1911, and daily gage readings were obtained in 1911 and 1912. The channel at the station shifted at times of high water. In consequence of this and of the infrequent discharge measurements, the ratings are not very well defined and the results are only approximate.

Discharge measurements of Fox Creek at Rolf's claim, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 19	1.67	4.42	May 22	1.20	1.26
Aug. 12	1.58	3.84	June 22	1.35	2.44
			Sept. 1	1.31	4.69

Daily gage height, in feet, and discharge, in second-feet, of Fox Creek at Rolf's claim for 1911–12.

[Drainage area, 8.3 square miles. Observer, Frank Rolf.]

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
1911.						
1	......	......	1.42	2.5	1.54	3.4
2	......	......	1.42	2.5	1.50	3.1
3	......	......	1.42	2.5	1.50	3.1
4	......	......	1.42	2.5	1.46	2.8
5	......	......	1.42	2.5	1.46	2.8
6	......	......	1.42	2.5	1.42	2.5
7	......	......	1.42	2.5	1.42	2.5
8	......	......	1.46	2.8	1.42	2.5
9	......	......	1.42	2.5	1.42	2.5
10	......	......	1.42	2.5	1.52	3.3
11	......	......	1.42	2.5	1.75	5.1
12	......	......	1.40	2.3	1.62	4.1
13	......	......	1.37	2.1	1.58	3.7
14	......	......	1.37	2.1	1.58	3.7
15	......	......	1.37	2.1	2.00	7.3
16	......	......	1.33	1.8	1.96	6.9
17	......	......	1.33	1.8	1.96	6.9
18	1.92	6.6	1.33	1.8	2.00	7.3
19	1.71	4.8	1.33	1.8	1.86	6.0
20	1.62	4.1	1.33	1.8	1.79	5.4
1911—Con.						
21	1.58	3.7	2.00	7.3	1.67	5.3
22	1.58	3.7	1.92	6.6	1.65	4.3
23	1.50	3.1	1.71	4.8	1.60	3.9
24	1.50	3.1	1.58	3.7	1.58	3.7
25	1.50	3.1	1.58	3.7	1.54	3.4
26	1.50	3.1	1.75	5.1	1.54	3.4
27	1.50	3.1	1.79	5.4	1.54	3.4
28	1.50	3.1	1.71	4.8	1.54	3.4
29	1.42	2.5	1.62	4.1	1.54	3.4
30	1.42	2.5	1.62	4.1	1.54	3.4
31	......	......	1.58	3.7	1.58	3.7
Mean discharge	......	3.58	......	3.26	......	4.07
Second-feet per square mile	......	0.443	......	0.393	......	0.490
Run-off (depth in inches on drainage area)	......	0.21	......	0.45	......	0.56
Maximum	......	6.6	......	7.3	......	7.3
Minimum	......	2.5	......	1.8	......	2.5
Accuracy	......	C	......	C	......	C

Daily gage height, in feet, and discharge, in second-feet, of Fox Creek at Rolf's claim for 1911–12—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1			1.35	2.4	1.15	1.0	1.45	7.0	1.35	5.3
2			1.90	11.5	1.40	2.9	1.40	6.0	1.35	5.3
3			1.60	5.4	1.60	5.4	1.40	6.0	1.35	5.3
4			1.40	2.9	1.40	2.9	1.40	6.0	1.35	5.3
5			1.25	1.6	1.25	1.6	1.40	6.0	1.35	5.3
6			1.15	1.0	1.15	1.0	1.40	6.0		
7			1.15	1.0	1.15	1.0	2.00	21		
8			1.60	5.4	1.10	.8	1.80	15		
9			1.85	10.2	1.10	.8	1.60	10		
10			1.65	6.2	1.25	1.6	1.60	10		
11			1.45	3.4	1.55	4.7	1.90	18		
12			1.40	2.9	1.55	4.7	1.90	18		
13			1.40	2.9	1.40	2.9	1.75	14		
14			1.35	2.4	1.65	6.2	1.65	11		
15			1.40	2.9	1.55	4.7	1.60	10		
16			1.55	4.7	1.40	2.9	1.60	10		
17			1.35	2.4	1.40	2.9	1.60	10		
18			1.25	1.6	1.45	3.4	1.60	10		
19			1.40	2.9	1.40	2.9	1.65	11		
20			1.30	2.0	1.50	4.0	1.55	9.0		
21			1.25	1.6	2.30	23	1.60	10		
22	1.25	1.6	1.35	2.4	1.85	16	1.55	9.0		
23	1.20	1.3	1.35	2.4	1.65	11	1.50	8.0		
24	1.15	1.0	1.45	3.4	1.70	12	1.50	8.0		
25	1.15	1.0	1.55	4.7	1.55	9.0	1.45	7.0		
26	1.15	1.0	1.60	5.4	1.70	12	1.40	6.0		
27	1.15	1.0	1.45	3.4	1.60	10	1.40	6.0		
28	1.20	1.3	1.30	2.0	1.50	8.0	1.40	6.0		
29	1.90	11.5	1.25	1.6	1.50	8.0	1.40	6.0		
30	1.60	5.4	1.15	1.0	1.50	8.0	1.35	5.3		
31	1.40	2.9			1.40	6.0	1.35	5.3		
Mean discharge		2.80		3.45		5.85		9.37		5.30
Second-feet per square mile		0.337		0.416		0.705		1.13		0.639
Run-off (depth in inches on drainage area)		0.13		0.46		0.81		1.30		0.12
Maximum		11.5		11.5		23		21		5.3
Minimum		1.0		1.0		0.8		5.3		5.3
Accuracy		C		C		C		C		C

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Seventymile River drainage basin, 1910 to 1912:

Miscellaneous measurements in Seventymile River drainage basin, 1910–1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 7, 1911	Seventymile River	Yukon River	Above Granite Creek	53.2	207	0.26
June 20, 1910	Flume Creek ditch		Near outlet	2.6		
July 20, 1910	do		do	2.5		
Sept. 5, 1910	do		do	3.5		
June 21, 1910	Deep Creek	Seventymile River	Mouth	3.1	4.8	.65
June 25, 1911	do	do	do	a .8	4.8	.17
June 24, 1912	do	do	do	a 1.1	4.8	.23
Sept. 7, 1912	do	do	do	2.68	4.8	.56
June 21, 1910	Nugget Creek	do	do	3.47	2.7	.17
June 21, 1911	do	do	do	a .9	2.7	.33
June 25, 1911	do	do	do	a .4	2.7	.15
June 24, 1912	do	do	do	a .8	2.7	.30
July 20, 1912	East Fork Granite Creek.	Granite Creek	1 mile above forks	25.2	45.6	.55
July 18, 1910	do	do	Above forks	10.4	68.1	.15
Do	Granite Creek	Seventymile River	Below forks	22	112	.20
June 25, 1911	do	do	Mouth	195	138	1.41
Aug. 7, 1911	do	do	do	40.2	138	.30
June 26, 1912	do	do	do	190	138	1.38
July 20, 1912	West Fork Granite Creek.	Granite Creek	1½ miles above forks	27.9	41.9	.67
June 18, 1910	Barney Creek	Seventymile River	Mouth	4.3		
June 26, 1911	do	do	do	a .8		
June 24, 1912	do	do	do	2.2		
June 22, 1910	Sonickson Creek ditch.		Outlet	2.8		
Sept. 9, 1912	Washington Creek ditch.		Intake	3.51		
June 26, 1911	Broken Neck Creek	Seventymile River	Mouth	1.3	2.9	.45
Aug. 6, 1911	do	do	do	a .60	2.9	.21
Aug. 11, 1911	do	do	do	1.12	2.9	.38
Sept. 10, 1912	do	do	do	1.06	2.9	.37
June 16, 1910	Mogul Creek	do	do	79	64.4	1.23
Aug. 30, 1910	do	do	do	47	64.4	.73
June 19, 1911	do	do	do	120	64.4	1.87
June 27, 1911	do	do	do	63.6	64.4	.99
July 1, 1911	do	do	do	69.9	64.4	1.08
June 23, 1912	do	do	do	67.2	64.4	1.04
Sept. 6, 1912	do	do	do	50.5	64.4	.78
Aug. 13, 1911	Curtis Bar Creek	do	do	a 1.8	1.7	1.06
June 15, 1910	Bryant Creek	do	2 miles above mouth	21	21.4	.98
Aug. 29, 1910	do	do	do	27	21.4	1.26
Sept. 8, 1910	do	do	do	19.2	21.4	.90
July 2, 1911	do	do	do	57.5	21.4	2.69
Aug. 13, 1911	do	do	do	50.4	21.4	2.35
June 21, 1912	do	do	do	16.0	21.4	.75
Sept. 4, 1912	do	do	do	18.9	21.4	.88
June 27, 1911	Rock Creek	do	Bridge	a .6	7.3	.082
June 30, 1911	do	do	do	a .4	7.3	.055
Aug. 5, 1911	do	do	do	a .9	7.3	.12
Aug. 13, 1911	do	do	do	a 1.2	7.3	.16
June 21, 1912	do	do	do	1.41	7.3	.19
Sept. 4, 1912	do	do	do	2.19	7.3	.30

a Discharge estimated.

WASHINGTON CREEK DRAINAGE BASIN.

Washington Creek rises in the divide north of the Seventymile and flows northward for about 25 miles to a junction with the Yukon. At the head the basin is about 18 miles wide and is drained by several large tributaries which reach from Barney Creek on the east to a point about opposite Flume Creek on the west. Ten miles below the head the basin is abruptly contracted to a width of about 6 miles, and it averages about that width to the mouth. The headwaters flow through broad valleys, which have gentle slopes rising to a uniform altitude of about 3,000 feet. The drainage area above the mouth is 190 square miles.

Just below the junction of two small feeders, which form the headwaters of the main stream and rise in the divide west of Barney Creek, a measurement was made August 31, 1910, to determine the quantity of water available on that day for diversion over the divide to be used for hydraulicking on Pleasant Creek, a small stream entering Seventymile River from the north just above Barney Creek. No accurate survey had been made, and it is doubtful if water could be carried over the divide in a ditch with the intake below the forks. It was difficult to obtain an accurate measurement because the stream flows through a flat swampy area, in a deep-cut channel with overhanging muck banks. A discharge of 0.78 second-foot was recorded.

In 1910 a ditch was constructed which diverted from one of the above-mentioned small feeders to a bench on Pleasant Creek. The maintenance of the ditch has given endless trouble, and the available water supply has been found entirely inadequate for mining.

BIRCH CREEK DRAINAGE BASIN.

DESCRIPTION.

Birch Creek flows into Yukon River almost exactly on the Arctic Circle and about 25 miles directly west of Fort Yukon. Its mouth is about 5 miles west of the confluence of Chandalar River with the Yukon.

The drainage comes almost entirely from the south and west through a complex system of water courses, and in outline the basin is extremely asymmetric. The headwaters interlock with those of Chena and Chatanika rivers. The creek is formed by the junction of Eagle and Ptarmigan creeks and flows southwestward for about 7 miles to the mouth of Twelvemile Creek, where it turns abruptly to the south and follows that direction for about 8 miles. It then receives the waters of Harrington Fork and takes an easterly course for about 45 miles to its confluence with the South Fork. The river then makes a sharp turn north and about 12 miles farther on leaves the mountainous country and enters the lowlands of the Yukon, through which it meanders sluggishly for over 100 miles, roughly paralleling the Yukon at a distance varying from 10 to 20 miles. Some of the tributaries from the right in downstream order are Fish, Bear, and Twelvemile creeks, Harrington Fork, Malburn, and Acme creeks, Clum Fork, McLean, Wolf, and Sheep creeks, and South Fork. From the left, in downstream order, Birch Creek receives Golddust, Butte, Fryingpan, Great Unknown, Harrison, Buckley Bar, Crooked, and Preacher creeks.

The topography of the Birch Creek basin (see Pl. VI, *A*) is similar to that prevailing throughout the Yukon-Tanana region. All the tributary streams rise at about the same elevation and near their heads all have steep grades which gradually diminish as they approach the main stream.

No lakes or natural reservoir sites occur at an elevation sufficient to furnish storage for increasing the water supply for hydraulic mining.

A description of the Crooked Creek basin with the stream-flow data gathered therein will be given separate consideration. (See p. 181.)

BIRCH CREEK ABOVE TWELVEMILE CREEK.

This station was established June 12, 1911. The gage was located on the right bank of Birch Creek about a mile above the mouth of Twelvemile Creek. No gage heights were obtained during 1912.

The rating curve is well defined below 40 second-feet and is fairly well defined for all stages up to 300 second-feet.

Discharge measurements of Birch Creek above Twelvemile Creek, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 12	4.37	227	July 18		27
July 18	3.10	24	Aug. 18	3.48	82
Aug. 3	2.86	12.3			
14	2.89	13.7			

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek above Twelvemile Creek for 1911.

[Drainage area, 88 square miles. Observer, John Olsen.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			5.5	550	2.9	14.0	3.1	24
2			4.95	388	2.85	12.0	3.2	31
3			4.3	210	2.85	12.0	3.3	39
4			4.5	263	2.85	12.0	3.4	48
5			4.1	161	2.85	12.0	3.35	44
6			4.75	331	2.8	10.0	3.35	44
7			4.1	161	2.85	12.0	3.25	35
8			3.75	91	2.85	12.0	3.15	28
9			3.5	58	2.9	14.0	3.15	28
10			3.45	53	2.9	14.0	3.1	24
11			3.45	53	2.9	14.0	3.2	31
12	4.35	223	3.45	53	2.9	14.0	3.25	35
13	4.95	388	3.25	35	2.9	14.0	3.25	35
14	5.25	475	3.25	35	2.9	14.0	3.3	39
15	5.35	505	3.25	35	3.5	58	3.3	39
16	5.1	431	3.25	35	3.7	83	3.3	39
17	5.2	460	3.1	24	3.7	83	3.2	31
18	5.1	431	3.1	24	3.6	70	3.2	31
19	5.0	402	3.1	24	3.55	64	3.15	28
20		340	3.05	21	3.5	58	3.15	28
21		280	3.0	18.3	3.45	53	3.15	28
22		270	3.05	21	3.4	48	3.1	24
23		260	3.0	18.3	3.35	44	3.2	31
24		200	2.95	16.2	3.3	39	3.25	35
25		180	2.95	16.2	3.2	31	3.25	35
26		170	2.95	16.2	3.15	28	3.2	31
27		240	2.95	16.2	3.1	24	3.25	35
28		160	2.95	16.2	3.1	24	3.2	31
29		110	2.9	14.0	3.1	24		
30		170	2.9	14.0	3.0	18.3		
31			2.9	14.0	3.0	18.3		
Mean discharge		300		89.9		30.6		33.2
Second-feet per square mile		3.41		1.02		0.348		0.377
Run-off (depth in inches on drainage area)		2.41		1.18		0.40		0.39
Maximum		505		550		83		48
Minimum		110		14.0		10.0		24
Accuracy		B		B		A		A

BIRCH CREEK BELOW TWELVEMILE CREEK.

This station was established June 12, 1911. The gage was located on the right bank of Birch Creek about a mile below the mouth of Twelvemile Creek. The gage datum remained constant during 1911, but was lowered at the beginning of the 1912 records. On June 25, 1912, the gage was removed by high water. A new gage was at once installed a short distance above the original location. A rating curve entirely independent of previous measurements was used at the new section.

Discharge measurements of Birch Creek below Twelvemile Creek in 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 12	5.61	647	June 6	4.65	218
13	5.46	489	8	4.30	138
July 18	3.80	35	July 18	3.28	43
Aug. 2	3.55	20	Aug. 17	3.56	102
14	3.65	25	18	3.57	103
			Sept. 5	3.77	160

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Birch Creek below Twelvemile Creek for 1911–12.

[Drainage area, 141 square miles. Observer, J. R. Parkin.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1				900	3.55	20	3.77	33	4.09	65
2				630	3.54	19.6	3.85	39		
3				290	3.54	19.6		40		
4				310	3.54	19.6		41		
5				240		19		42		
6				420		19	3.91	44		
7				290		20	3.90	43		
8				160		20	3.88	41		
9				100		20	3.85	39		
10				80	3.56	20	3.90	43		
11			4.10	66	3.61	23	4.02	56		
12	5.50	544	4.09	65	3.56	20	4.05	60		
13	5.64	627	4.01	54	3.58	21	4.05	60		
14	5.60	602	3.92	45	3.63	24	4.09	65		
15	5.76	704	3.92	45	4.14	72	4.01	54		
16	5.82	744	3.87	41	4.50	144	4.02	56		
17	5.96	842	3.80	35	4.44	130	3.95	48		
18	5.73	684	3.78	34	4.45	132	3.91	44		
19	5.51	550	3.76	32		120	3.88	41		
20	5.23	401	3.75	32		110	3.82	37		
21	5.12	350	3.73	30		90	3.85	39		
22	4.93	276	3.69	27		80	3.83	37		
23	4.92	272	3.66	26		70	3.85	39		
24	4.86	251	3.64	24		60	3.86	40		
25	4.70	199	3.61	23		50	3.88	41		
26	4.62	176	3.62	23		40	4.01	54		
27	4.96	287	3.64	24	3.78	34	4.16	75		
28	4.64	182	3.60	22	3.76	32	4.20	81		
29	4.42	125	3.59	22	3.75	32	4.16	75		
30	4.70	199	3.58	21	3.74	31	4.15	74		
31			3.57	21	3.73	30				
Mean discharge		422		133		49.7		49.4		
Second-feet per square mile		2.99		0.943		0.352		0.350		
Run-off (depth in inches on drainage area)		2.11		1.09		0.41		0.40		
Maximum		842		900		144		81		
Minimum		125		21		19		33		
Accuracy		B		B		A		A		

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Birch Creek below Twelvemile Creek for 1911–12—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
1912.										
1	6.1	1,060	3.54	96	3.30	47	3.52	91	3.68	132
2	6.1	1,060	3.55	98	3.28	44	3.61	113	3.68	132
3	5.80	835	3.52	91	3.26	41	3.67	130	3.62	116
4	5.20	460	3.41	67	3.31	49	3.79	166	3.58	105
5	4.90	322	3.38	61	3.30	47	3.80	169	3.59	108
6	4.70	248	3.31	49	3.30	47	3.74	150	3.60	110
7	4.46	172	3.30	47	3.72	144	3.70	138	3.60	110
8	4.35	144	3.28	44	3.85	186	3.68	132	3.52	91
9	4.34	142	3.26	41	3.66	127	3.68	132	3.54	96
10	4.25	121	3.24	38	3.56	100	3.64	121	3.52	91
11	4.10	90	3.27	42	3.95	222	3.61	113	3.50	86
12	4.50	183	3.26	41	4.20	323	3.59	108	3.49	84
13	4.90	322	3.24	38	3.98	233	3.60	110	3.50	86
14	4.80	284	3.29	46	3.82	176	3.52	91		
15	5.00	364	3.30	47	3.72	144	3.60	110		
16	5.60	695	3.27	42	3.64	121	3.65	124		
17	5.35	542	3.28	44	3.56	100	3.84	183		
18	5.45	600	3.28	44	3.52	91	4.11	284		
19	5.65	729	3.28	44	3.50	86	4.02	248		
20	5.10	410	3.28	44	3.50	86	4.09	276		
21	4.95	343	3.27	42	3.48	82	4.08	272		
22	5.30	513	3.26	41	3.46	78	4.00	240		
23	6.5	1,410		42	3.46	78	3.90	203		
24	6.1	1,060	3.28	44	3.46	78	3.84	183		
25		738	3.26	41	3.47	80	3.79	166		
26	4.4	417	3.32	51	3.52	91	3.72	144		
27	4.15	302	3.34	54	3.59	108	3.72	144		
28	3.94	218	3.38	61	3.57	103	3.71	141		
29	3.76	157	3.39	63	3.55	98	3.70	138		
30	3.64	121	3.38	61	3.51	88	3.70	138		
31			3.34	54	3.51	88				
Mean discharge		469		52.2		109		159		104
Second-feet per square mile		3.33		0.370		0.773		1.13		0.738
Run-off (depth in inches on drainage area)		3.72		0.43		0.89		1.26		0.36
Maximum		1,410		98		323		276		132
Minimum		90		38		41		91		84
Accuracy		C		A		A		A		A

BIRCH CREEK BELOW GREAT UNKNOWN CREEK.

This station was established June 5, 1912. The gage was located on the right bank of Birch Creek about 100 feet below the mouth of Great Unknown Creek. The rating curve is well defined between 120 and 400 second-feet. All measurements were made by wading. The measuring section was good and the channel seemed to be fairly permanent.

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek below Great Unknown Creek for 1912.

[Drainage area, 376 square miles. Observer, F. C. Sutliff.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.65	218	3.28	125	3.70	234	3.80	272
2			3.55	186	3.20	113		272	3.80	272
3			3.75	253		113		300	3.75	253
4			3.55	186		113	3.95	344	3.69	231
5	4.10	355	3.42	153	3.20	113	4.00	355	3.68	227
6	4.05	378	3.35	138	3.18	110		320	3.70	234
7		345		130	3.55	186	3.85	292	3.65	218
8	3.90	313		120	4.10	400	3.80	272	3.65	218
9	4.05	378	3.20	113	3.80	272	3.75	253	3.60	201
10	4.00	355	3.15	106	3.65	218	3.70	234	3.60	201
11	3.85	292	3.18	110	3.80	272	3.69	231	3.52	178
12	4.15	424	3.20	113	4.55	626	3.65	218	3.49	170
13	4.8	759	3.16	107		524		210	3.42	153
14	4.60	652	3.19	112		422	3.60	201	3.30	128
15		800	3.22	116		320	3.68	227	3.32	132
16		900	3.20	113	3.65	218	3.80	272	3.28	125
17		850	3.20	113	3.60	201	4.20	448	3.25	120
18		900	3.25	120	3.60	201	4.55	626	3.22	116
19	6.4	1,740	3.25	120	3.50	172	4.50	599		
20	5.2	985	3.25	120	3.49	170		610		
21	4.70	705	3.22	116	3.42	153		500		
22	4.9	814	3.20	113	3.40	148		400		
23	7.2	2,260	3.19	112	3.42	153		340		
24	7.6	2,520	3.18	110	3.46	162		320		
25	7.1	2,200	3.18	110	3.50	172		310		
26	5.8	1,350	3.19	112		240		300		
27	4.8	759	3.22	116		300		290		
28	4.4	547	3.35	138		290		280		
29	4.05	378		135		280		270		
30	3.85	292		132	3.80	272	3.80	272		
31			3.30	128	3.75	253				
Mean discharge		856		131		236		327		192
Second-feet per square mile		2.28		0.348		0.628		0.870		0.511
Run-off (depth in inches on drainage area)		2.20		0.40		0.72		0.97		0.34
Maximum		2,520		253		626		626		272
Minimum		292		106		110		201		116
Accuracy		D		A		B		B		B

NOTE.—*Discharges on days of missing gage heights were estimated by aid of comparative hydrographs.*

BIRCH CREEK BELOW CLUMS FORK.

This station was established June 8, 1911. The gage was located on the right bank of Birch Creek just below the mouth of McLean Creek and about 3 miles below Clums Fork. Conditions at the station were favorable for accuracy. The rating curve is fairly well defined for low and medium stages. Measurements were made from a boat at high and medium water and by wading at low water.

Discharge measurements of Birch Creek below Clums Fork, 1910–11.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
June 8	4.38	527	June 10	5.03	1,600
25	4.46	592	Aug. 1	2.15	61
July 26	4.06	386			

NOTE.—Zero of 1910 gage was 0.90 foot below that of 1911.

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek below Clums Fork for 1910–11.

[Drainage area, 600 square miles. Observers: Mrs. F. Warren, 1910; Robert Warren, 1911.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			5.14	1,010	4.40	550	4.22	457
2			4.50	604	4.15	424	4.32	508
3			4.08	391	3.99	353	4.28	487
4			3.85	296	3.79	272	4.30	497
5			6.90	2,440	3.69	237	4.61	666
6			5.60	1,340	3.64	220	4.95	881
7			4.85	816	3.54	188	4.64	684
8	4.34	518	4.38	539	3.50	175	4.48	593
9	4.43	566	4.12	409	3.46	164	4.38	539
10	6.32	1,920	3.98	349	3.40	147	4.30	497
11	6.90	2,440	3.85	296	3.40	147	4.26	477
12	6.95	2,480	3.82	284	3.38	142	4.18	438
13	5.66	1,390	3.88	307	3.32	125	4.09	396
14	4.90	848	3.75	258	3.30	120	4.15	424
15	4.50	604	3.60	207	3.31	123	6.10	1,740
16	4.50	604	3.48	169	3.30	120	6.15	1,780
17	4.36	529	3.45	161	3.32	125	6.05	1,700
18	4.23	462	3.80	276	4.00	357	5.82	1,520
19	4.06	383	4.12	409	5.99	1,650	5.42	1,200
20	4.04	374	3.85	296	5.30	1,120	4.90	848
21	4.10	400	3.68	233	4.70	720	4.80	783
22	6.37	1,960	3.66	227	4.45	577	4.58	649
23	5.26	1,090	3.78	269	4.38	539	4.48	593
24	4.72	733	4.40	550	4.22	457	4.42	561
25	4.24	467	4.42	561	4.44	572	4.45	577
26	4.05	378	3.99	353	4.80	783	4.49	599
27	3.97	344	3.80	276	4.74	745	4.42	561
28	4.09	396	3.68	233	4.88	835	4.41	555
29	5.32	1,130	3.56	194	4.66	696	4.35	524
30	5.96	1,630	3.96	340	4.49	599	4.18	438
31			4.75	752	4.35	524		
Mean discharge		941		479		445		739
Second-feet per square mile		1.57		0.798		0.742		1.23
Run-off (depth in inches on drainage area)		1.34		0.92		0.86		1.37
Maximum		2,480		2,440		1,650		1,780
Minimum		344		161		120		396
Accuracy		B		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek below Clums Fork for 1910–11—Continued.

Day	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1			3.48	541	2.15	62	2.69	205
2			4.40	1,120		60	2.76	228
3			4.95	1,530		55	2.88	272
4			4.55	1,220		55	2.90	280
5			4.35	1,080		55	2.85	261
6			3.82	733		50	2.69	205
7			4.35	1,080		50	2.70	208
8			3.75	691		50	2.69	205
9	5.02	1,590	3.25	428		80	2.67	198
10	4.97	1,550	3.05	341		90	2.65	192
11	4.60	1,260	2.98	312	2.50	147	2.72	215
12	4.66	1,300	3.40	500	2.62	182	2.85	261
13	4.89	1,480	3.00	320	2.71	211		290
14	4.80	1,410	2.77	232	2.78	235		290
15	5.15	1,690	2.72	215	3.60	604	2.85	261
16	5.09	1,640	2.62	182	4.75	1,370	2.78	235
17	5.35	1,860	2.55	162	4.25	1,010	2.55	162
18	5.80	2,270	2.50	147	4.05	878	2.42	125
19	5.11	1,660	2.44	131	3.75	691	2.40	120
20	4.68	1,320	2.38	115	3.44	520	2.36	110
21	4.24	1,000	2.36	110	3.20	405	2.38	115
22	4.00	845	2.35	108	2.98	312	2.42	125
23	3.82	733	2.31	98	2.88	272	2.50	147
24	3.80	721	2.28	90	2.79	239	2.58	170
25	3.62	615	2.28	90	2.72	215	2.65	192
26	3.35	476	2.29	93	2.72	215	2.85	261
27	3.55	578	2.28	90		210		450
28	3.65	628	2.26	86	2.70	208	3.40	500
29	3.30	451	2.26	86		208		
30	3.45	526	2.20	72	2.69	205		
31			2.18	68	2.70	208		
Mean discharge		1,160		389		295		224
Second-feet per square mile		1.93		0.648		0.492		0.373
Run-off (depth in inches on drainage area)		1.58		0.75		0.57		0.39
Maximum		2,270		1,530		1,370		500
Minimum		451		68		50		110
Accuracy		B		A		A		A

BIRCH CREEK ABOVE SHEEP CREEK.

This station was established June 1, 1911. The gage was located on the left bank at Buckley Bar and about a mile above Sheep Creek. The measurements were made from a boat at high and medium water and by wading at low water. The station conditions were favorable for accuracy and the rating curve is well defined for all stages.

Discharge measurements of Birch Creek above Sheep Creek in 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 1	6.54	4,070	May 28	3.84	707
2	5.70	2,840	29	5.96	2,880
July 26	2.74	102	July 14	3.05	200
28	2.72	104			
Aug. 18	4.33	1,330			

NOTE.—Zero of 1912 gage was 0.08 foot below that of 1911.

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek above Sheep Creek for 1911–12.

[Drainage area, 873 square miles. Observer, Chas. H. Rogers.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1	6.54	4,030	3.72	722	2.71	102	....	230
2	5.90	3,150	4.12	1,090	2.70	99	3.00	250
3	6.26	3,630	5.25	2,330	2.68	93	3.06	275
4	6.02	3,310	4.64	1,630	2.71	102	3.12	292
5	6.16	3,490	4.53	1,510	2.68	93	3.07	264
6	6.26	3,630	4.08	1,040	2.67	90	3.04	247
7	6.33	3,730	4.27	1,240	2.65	84	3.03	242
8	5.47	2,590	3.94	916	2.64	82	2.99	220
9	5.52	2,660	3.52	563	2.66	87	2.97	210
10	5.14	2,200	3.24	366	2.69	96	2.96	205
11	4.76	1,770	3.14	304	....	150	3.04	247
12	4.73	1,730	3.26	379	2.94	195	3.14	304
13	5.32	2,410	3.16	316	....	230	3.16	316
14	5.02	2,050	3.08	269	....	300	3.18	328
15	5.24	2,320	2.99	220	....	900	3.15	310
16	5.42	2,530	2.94	195	4.90	1,920	3.14	304
17	5.33	2,430	2.94	195	4.40	1,370	3.11	286
18	6.26	3,630	2.92	185	4.32	1,290	3.10	280
19	5.44	2,560	2.88	166	3.90	880	3.05	252
20	5.02	2,050	2.84	148	3.92	898	3.04	247
21	4.49	1,470	2.81	134	3.46	519	....	230
22	4.20	1,170	2.80	130	3.32	419	....	210
23	4.02	988	2.78	124	3.21	346	2.94	195
24	3.98	952	2.74	111	3.12	292	3.02	236
25	3.79	782	2.72	105	3.10	280	3.08	269
26	3.58	610	2.74	111	3.04	247	3.14	304
27	3.70	705	2.74	111	3.02	236	3.43	497
28	3.72	722	2.72	105	3.03	242	3.59	617
29	3.58	610	2.76	118	3.02	236	3.68	689
30	3.70	705	2.74	111	3.01	230	3.64	657
31	....	....	2.73	108	....	230	....	....
Mean discharge	....	2,150	....	486	....	398	....	307
Second-feet per square mile	....	2.46	....	0.557	....	0.456	....	0.352
Run-off (depth in inches on drainage area)	....	2.74	....	0.64	....	0.53	....	0.39
Maximum	....	4,030	....	2,330	....	1,920	....	689
Minimum	....	610	....	105	....	82	....	195
Accuracy	....	A	....	A	....	A	....	A

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek above Sheep Creek for 1911-12—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1			6.3	3,320	3.70	605	3.12	236	3.60	535
2			8.4	6,370	3.50	465	3.11	230	3.90	755
3			7.1	4,440	3.60	535	3.08	214	3.90	755
4			6.1	3,060	3.50	465	3.08	214	3.90	755
5			5.0	1,780	3.37	382	3.06	203	3.90	755
6			4.4	1,190	3.26	316	3.06	203	3.90	755
7			4.10	920	3.16	258	3.60	535	3.80	680
8	4.7	1,470	3.90	755	3.10	225	4.20	1,010	3.85	718
9	4.4	1,190	4.00	835	3.09	220	3.90	755	3.70	605
10	4.7	1,470	4.20	1,010	3.06	203	3.65	570	3.70	605
11	4.5	1,280	3.95	795	3.10	225	3.95	795	3.65	570
12	4.7	1,470	3.80	680	3.10	225	4.80	1,570	3.60	535
13	5.1	1,890	5.4	2,220	3.10	225		1,200	3.55	500
14	5.9	2,810	5.0	1,780	3.09	220		1,000		500
15	5.1	1,890		2,200	3.12	236		800	3.70	605
16	5.6	2,450		2,500	3.10	225		600	3.80	680
17	5.6	2,450		2,400	3.08	214	3.60	535	3.90	755
18	5.0	1,780		3,000	3.09	220	3.55	500	4.6	1,370
19	4.5	1,280	6.8	4,020	3.13	242	3.50	465	4.7	1,470
20	4.35	1,140		2,200	3.13	242	3.43	420		1,700
21	4.35	1,140	4.8	1,570	3.15	252	3.36	376		2,000
22	4.30	1,100	5.2	2,000	3.16	258	3.34	364	5.8	2,690
23	4.8	1,570	7.5	5,020	3.13	242	3.30	340	5.6	2,450
24	4.5	1,280	9.5	8,100	3.12	236	3.30	340		
25	3.95	795	9.4	7,940	3.08	214	3.36	376		
26	3.75	642	7.1	4,440	3.05	198	3.41	406		
27	3.80	680	5.5	2,330	3.09	220	3.75	642		
28	3.80	680	4.7	1,470	3.24	304	3.85	718		
29	5.9	2,810	4.3	1,100	3.30	340	3.80	680		
30	6.0	2,930	3.8	680	3.26	316	3.65	570		
31	4.9	1,670			3.19	274	3.60	535		
Mean discharge		1,580		2,670		284		561		989
Second-feet per square mile		1.81		3.06		0.325		0.643		1.13
Run-off (depth in inches on drainage area)		1.62		3.41		0.37		0.74		0.97
Maximum		2,930		8,100		605		1,570		2,690
Minimum		642		680		198		203		500
Accuracy		A		B		A		A		A

BIRCH CREEK AT FOURTEENMILE HOUSE.

This station was established June 26, 1908. The gage, which was a vertical staff located on the left bank of Birch Creek just above the Alaska Road Commission ferry, was read morning and evening. It was set at a different level each season, and the published gage heights of different years are not comparable, for they have not been reduced to a common datum. Measurements were made from the ferry, except at extreme low water, when they were made by wading at the ford above the gage. The highest discharge measurements were obtained in 1911, and the direction of the curve for that year has been used to define the high-water curves for the other years. All the rating curves are fairly well defined for low and medium stages. The measuring conditions were fair, and the discharges as published should not vary far from the actual flow.

Discharge measurements of Birch Creek at Fourteenmile House for 1908–1912.

Date.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.	Date.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet per sec.*	*Feet.*	*Sec.-ft.*		*Feet.*	*Sq. ft.*	*Feet per sec.*	*Feet.*	*Sec.-ft.*
1908.						1911.					
June 27	220	655	1.62	3.17	1,060	May 28	300	1,920	3.74	6.90	7,190
23	215	653	1.60	3.07	1,040	29	295	1,770	3.58	6.44	6,330
Sept. 11	264	960	2.18	4.00	2,060	July 24	200	220	1.40	1.86	*a* 308
12	252	870	2.02	3.82	1,720						
						1912.					
1909.						May 25	278	880	1.82	3.16	1,600
June 17	275	1,190	2.75	3.55	3,270	July 8	232	307	1.92	2.05	*a* 589
18	278	1,300	3.15	4.15	4,090	12	227	272	1.76	1.86	*a* 478
Aug. 8	255	868	2.05	2.43	1,780	Sept. 12	251	419	2.46	2.65	*a* 1,030
1910.											
June 5	270	1,020	2.18	3.12	2,230						
July 18	226	459	1.18	1.16	*a* 542						
19	195	619	1.31	1.63	908						

a Wading measurements.

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek at Fourteenmile House for 1908–1912.

[Drainage area, 2,150 square miles. Observer, C. R. Rieger.]

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.												
1					3.40	1,330	2.60	655	3.6	1,550		
2					3.10	1,020	2.55	628	3.7	1,660		
3					3.00	940	2.50	600	4.1	2,170		
4					3.30	1,220	2.50	600	5.6	4,700		
5					3.05	982	2.50	600	6.0	5,500		
6					3.00	940	2.50	600	5.8	5,100		
7					3.15	1,070	2.45	575	5.2	3,950		
8					3.9	1,900	2.40	550	5.1	3,770		
9					4.3	2,450	2.40	550	4.8	3,250		
10					4.2	2,310	3.50	1,440	4.3	2,450		
11					3.8	1,780	3.45	1,380	4.0	2,030		
12					3.45	1,380	3.25	1,170	3.9	1,900		
13					3.30	1,220	3.10	1,020	3.7	1,660		
14					3.10	1,020	3.00	940	3.7	1,660		
15					3.00	940	2.90	860	3.6	1,550		
16					3.00	940	2.90	860	3.6	1,550		
17					3.10	1,020	2.85	822	3.6	1,550		
18					3.05	982	2.90	860	3.6	1,550		
19					3.00	940	2.90	860	3.6	1,550		
20					2.90	860	2.95	900	3.7	1,660		
21					2.80	785	3.00	940	3.6	1,550		
22					2.70	715	3.20	1,120	3.50	1,440		
23					2.60	655	3.7	1,660	3.35	1,280		
24					2.60	655	3.6	1,550	3.20	1,120		
25					2.50	600	3.45	1,380	3.10	1,020		
26			3.35	1,280	2.50	600	3.45	1,380	3.00	940		
27			3.20	1,120	2.60	655	3.40	1,330	2.90	860		
28			3.10	1,020	2.65	685	3.35	1,280	2.80	785		
29			3.08	1,010	2.60	655	3.50	1,440	2.70	715		
30			3.20	1,120	2.60	655	3.8	1,780				
31					2.65	685	3.7	1,660				
Mean discharge				1,110		1,050		1,030		2,090		
Second-feet per square mile				0.516		0.488		0.479		0.972		
Run-off (depth in inches on drainage area)				0.10		0.56		0.55		1.05		
Maximum				1,280		2,450		1,780		5,500		
Minimum				1,010		600		550		715		
Accuracy				A		A		A		A		

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek at Fourteenmile House for 1908-1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.												
1			3.6	3,260	2.4	1,740	3.4	2,970	1.5	980	1.2	780
2			3.7	3,410	2.1	1,450	3.1	2,550	1.4	910	1.2	780
3			3.6	3,260	2.0	1,370	3.0	2,420	1.4	910		
4			3.5	3,110	1.8	1,210	3.2	2,690	1.4	910		
5			3.4	2,970	1.8	1,210	2.8	2,180	1.3	840		
6			3.3	2,830	1.8	1,210	2.5	1,840	1.3	840		
7			3.2	2,690	1.8	1,210	2.4	1,740	1.2	780		
8			3.0	2,420	2.0	1,370	2.4	1,740	1.2	780		
9			4.0	3,910	2.1	1,450	2.5	1,840	1.2	780		
10			7.2	11,200	2.2	1,540	3.0	2,420	1.2	780		
11			5.0	5,850	2.4	1,740	3.3	2,830	1.2	780		
12			4.4	4,640	2.8	2,180	2.9	2,300	1.2	780		
13			4.6	5,020	4.0	3,910	2.7	2,060	1.2	780		
14			4.5	4,830	5.3	6,520	2.6	1,950	1.2	780		
15	4.2	4,270	4.9	5,640	7.0	10,700	2.4	1,740	1.2	780		
16	5.0	5,850	4.2	4,270	5.4	6,750	2.2	1,540	1.2	780		
17	6.2	8,650	3.4	2,970	3.8	3,570	2.1	1,450	1.2	780		
18	7.2	11,200	4.1	4,090	3.0	2,420	2.0	1,370	1.3	840		
19	8.1	13,700	3.7	3,410	2.2	1,540	1.9	1,290	1.3	840		
20	8.0	13,400	3.2	2,690	2.0	1,370	1.8	1,210	1.2	780		
21	7.8	12,800	2.9	2,300	2.0	1,370	2.4	1,740	1.2	780		
22	7.1	11,000	2.6	1,950	1.9	1,290	2.6	1,950	1.2	780		
23	6.2	8,650	2.4	1,740	1.8	1,210	2.3	1,640	1.2	780		
24	4.6	5,020	2.5	1,840	1.8	1,210	2.1	1,450	1.2	780		
25	4.3	4,450	2.9	2,300	1.6	1,050	2.0	1,370	1.2	780		
26	4.0	3,910	3.2	2,690	1.6	1,050	1.8	1,210	1.2	780		
27	4.0	3,910	3.3	2,830	1.5	980	1.8	1,210	1.2	780		
28	3.9	3,740	3.2	2,690	1.8	1,210	1.8	1,210	1.2	780		
29	3.8	3,570	2.9	2,300	3.0	2,420	1.7	1,130	1.2	780		
30	3.7	3,410	2.6	1,950	3.1	2,550	1.6	1,050	1.2	780		
31	3.6	3,260			3.4	2,970	1.5	980				
Mean discharge		7,110		3,500		2,320		1,780		804		780
Second-feet per square mile		3.31		1.63		1.08		0.828		0.374		0.363
Run-off (depth in inches on drainage area)		2.09		1.82		1.24		0.95		0.42		0.03
Maximum		13,700		11,200		10,700		2,970		980		
Minimum		3,260		1,740		980		980		780		
Accuracy		B		B		B		A		B		B

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek at Fourteenmile House for 1908–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.												
1	......	......	4.5	4,320	4.2	3,800	2.6	1,650	1.8	970	2.0	1,120
2	......	......	4.0	3,460	3.6	2,860	2.3	1,370	2.0	1,120	1.9	1,040
3	......	......	3.6	2,860	2.9	1,970	2.0	1,120	2.3	1,370	1.9	1,040
4	......	......	3.6	2,860	2.6	1,650	1.8	970	2.3	1,370	1.9	1,040
5	......	......	3.2	2,320	2.5	1,550	1.50	760	2.2	1,280	1.9	1,040
6	......	......	3.0	2,080	5.4	6,140	1.45	730	2.5	1,550	1.9	1,040
7	......	......	2.7	1,750	3.8	3,150	1.30	640	2.6	1,650	......	......
8	......	......	2.5	1,550	3.2	2,320	1.20	580	2.4	1,460	......	......
9	......	......	2.4	1,460	2.7	1,750	1.25	610	2.2	1,280	......	......
10	......	......	2.9	1,970	2.0	1,120	1.30	640	2.1	1,200	......	......
11	......	......	4.4	4,140	1.8	970	1.30	640	2.0	1,120	......	......
12	......	......	5.8	7,070	1.8	970	1.20	580	2.0	1,120	......	......
13	4.3	3.970	5.1	5,500	......	900	1.10	530	2.0	1,120	......	......
14	4.6	4,500	3.7	3,000	......	830	1.00	480	2.0	1,120	......	......
15	5.3	5,920	3.1	2,200	......	760	1.00	480	2.0	1,120	......	......
16	5.9	7,310	2.8	1,860	......	690	.95	455	3.6	2,860	......	......
17	5.9	7,310	2.6	1,650	......	620	.95	455	3.9	3,300	......	......
18	5.7	6,830	2.5	1,550	1.15	560	1.00	480	3.9	3,300	......	......
19	5.2	5,710	2.3	1,370	1.7	900	1.25	610	3.6	2,860	......	......
20	4.8	4,890	2.2	1,280	2.0	1,120	2.8	1,860	3.2	2,320	......	......
21	4.6	4,500	2.1	1,200	1.7	900	2.4	1,460	2.6	1,650	......	......
22	4.6	4,500	2.4	1,460	1.6	830	2.2	1,280	2.4	1,460	......	......
23	4.7	4,690	4.0	3,460	1.50	760	2.0	1,120	2.3	1,370	......	......
24	5.0	5,290	3.2	2,320	1.6	830	1.8	970	2.3	1,370	......	......
25	5.9	7,310	2.3	1,370	2.0	1,120	1.8	970	2.2	1,280	......	......
26	6.2	8,030	2.1	1,200	2.0	1,120	2.1	1,200	2.3	1,370	......	......
27	5.8	7,070	2.0	1,120	1.8	970	2.3	1,370	2.3	1,370	......	......
28	4.2	3,800	2.6	1,650	1.6	830	2.2	1,280	2.3	1,370	......	......
29	4.0	3,460	4.5	4,320	1.50	760	2.2	1,280	2.2	1,280	......	......
30	3.9	3,300	......	4,060	1.50	760	2.1	1,200	2.0	1,120	......	......
31	4.1	3,630	......	......	1.7	900	2.0	1,120	......	......	......	......
Mean discharge	......	5,370	......	2,550	......	1,430	......	932	......	1,570	......	1,050
Second-feet per square mile	......	2.50	......	1.19	......	0.665	......	0.434	......	0.730	......	0.488
Run-off (depth in inches on drainage area)	......	1.77	......	1.33	......	0.77	......	0.50	......	0.81	......	0.11
Maximum	......	8,030	......	7,070	......	6,140	......	1,860	......	3,300	......	1,120
Minimum	......	3,300	......	1,120	......	560	......	455	......	970	......	1,040
Accuracy	......	B	......	B	......	A	......	A	......	A	......	A

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek at Fourteenmile House for 1908–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.												
1	......	......	7.7	9,240	3.30	1,140	1.65	245	2.20	440	2.20	440
2	......	......	6.9	7,320	3.50	1,330	1.65	245	2.30	480	2.30	480
3	......	......	6.4	6,180	4.4	2,500	1.60	230	2.30	480	2.40	525
4	......	......	6.3	5,960	5.0	3,470	1.60	230	2.30	480	2.45	550
5	......	......	6.2	5,740	4.7	2,970	1.60	230	2.30	480	2.50	575
6	......	......	6.4	6,180	4.7	2,970	1.60	230	2.30	480	2.40	525
7	......	......	6.7	6,840	4.3	2,350	1.55	218	2.30	480	2.30	480
8	......	......	5.9	5,120	4.3	2,350	1.50	205	2.30	480	2.20	440
9	......	......	5.5	4,360	3.8	1,670	1.50	205	2.30	480	2.00	360
10	......	......	5.2	3,820	3.40	1,230	1.50	205	2.20	440	1.90	325
11	......	......	4.9	3,300	3.10	970	1.60	230	2.15	420	1.80	290
12	......	......	4.8	3,130	3.00	890	1.70	260	2.10	400	1.70	260
13	......	......	4.8	3,130	2.85	775	2.00	360	2.20	440	1.75	275
14	......	......	4.9	3,300	2.60	625	2.00	360	2.40	525	1.70	260
15	5.5	4,360	4.9	3,300	2.55	600	2.00	360	2.35	502	1.70	260
16	5.7	4,740	5.3	4,000	2.50	575	3.35	1,180	2.25	460	1.90	325
17	7.3	8,280	5.3	4,000	2.35	502	4.2	2,200	2.20	440	2.10	400
18	8.6	11,700	5.9	5,120	2.25	460	4.0	1,920	2.15	420	2.00	360
19	9.7	14,800	6.0	5,320	2.20	440	3.8	1,670	2.20	440	1.90	325
20	9.4	13,400	5.3	4,000	2.10	400	3.40	1,230	2.30	480	1.70	260
21	8.6	11,700	4.8	3,130	2.10	400	3.20	1,050	2.30	480	1.60	230
22	7.4	8,520	4.4	2,500	2.00	360	3.05	930	2.40	525	1.50	205
23	6.2	5,740	4.0	1,920	1.90	325	2.80	740	2.45	550	1.48	202
24	5.5	4,360	3.8	1,670	1.90	325	2.60	625	2.40	525	......	......
25	6.2	5,740	3.8	1,670	1.80	290	2.40	525	2.40	525	......	......
26	7.8	9,480	3.6	1,440	1.80	290	2.30	480	2.30	480	......	......
27	8.0	10,000	3.30	1,140	1.75	275	2.25	460	2.35	502	......	......
28	7.0	7,560	3.20	1,050	1.75	275	2.25	460	2.30	480	......	......
29	6.6	6,620	3.20	1,050	1.70	260	2.25	460	2.20	440	......	......
30	6.2	5,740	3.10	970	1.70	260	2.20	440	2.20	440	......	......
31	5.6	4,550	......	......	1.70	260	2.20	440	......	......	......	......
Mean discharge	......	8,080	......	3,860	......	1,020	......	601	......	473	......	363
Second-feet per square mile	......	3.76	......	1.80	......	0.474	......	0.280	......	0.220	......	0.169
Run-off (depth in inches on drainage area)	......	2.38	......	2.01	......	0.55	......	0.32	......	0.25	......	0.14
Maximum	......	14,800	......	9,240	......	3,470	......	2,200	......	550	......	575
Minimum	......	4,360	......	970	......	260	......	205	......	400	......	202
Accuracy	......	B	......	A	......	A	......	A	......	A	......	A

Daily gage height, in feet, and discharge, in second-feet, of Birch Creek at Fourteenmile House for 1908–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1			4.4	3,460	3.1	1,510	1.80	450	2.55	960	2.9	1,290
2			6.6	8,070	2.8	1,190	1.80	450	2.7	1,090	2.9	1,290
3			7.2	9,560	2.8	1,190	1.75	425	3.0	1,400	2.8	1,190
4			6.3	7,360	2.9	1,290	1.75	425	2.9	1,290	2.8	1,190
5			5.0	4,570	2.50	920	1.70	400	2.9	1,290	2.8	1,190
6			4.1	2,950	2.25	725	1.70	400	2.9	1,290	2.7	1,090
7			3.6	2,180	2.20	690	1.80	450	2.8	1,190	2.65	1,040
8			3.2	1,630	2.10	620	2.8	1,190	2.8	1,190	2.65	1,040
9			3.0	1,400	2.00	560	3.2	1,630	2.8	1,190	2.65	1,040
10	3.0	1,400	3.3	1,760	2.00	560	3.1	1,510	2.7	1,090	2.60	1,000
11	3.1	1,510	3.3	1,760	1.80	450	2.8	1,190	2.7	1,090	2.60	1,000
12	3.3	1,760	3.0	1,400	1.80	450	4.0	2,780	2.65	1,040	2.60	1,000
13	3.5	2,040	3.8	2,470	1.85	475	4.4	3,460	2.6	1,000	2.55	960
14	4.2	3,120	4.4	3,460	1.80	450	3.6	2,180	2.6	1,000	2.50	920
15	4.2	3,120	4.0	2,780	1.80	450	3.2	1,630	2.55	960	2.40	840
16	4.4	3,460	4.0	2,780	1.90	500	3.0	1,400	2.55	960	2.30	760
17	4.6	3,820	5.0	4,570	1.80	450	3.0	1,400	2.7	1,090	2.20	690
18	4.2	3,120	4.4	3,460	1.80	450	2.8	1,190	3.4	1,900	2.10	620
19	3.7	2,320	4.4	3,460	1.80	450	2.7	1,090	3.7	2,320	1.90	500
20	3.4	1,900	5.6	5,800	1.85	475	2.60	1,000	3.8	2,470	1.70	400
21	3.2	1,630	4.8	4,190	1.80	450	2.40	840	4.4	3,460	1.60	350
22	3.0	1,400	4.1	2,950	1.90	500	2.40	840	4.7	4,000		
23	3.2	1,630	4.6	3,820	1.80	450	2.35	800	4.4	3,460		
24	3.8	2,470	7.0	9,060	1.80	450	2.35	800	4.1	2,950		
25	3.4	1,900	8.9	14,100	1.80	450	2.30	760	4.0	2,780		
26	2.9	1,290	8.5	13,000	1.80	450	2.30	760	3.7	2,320		
27	2.8	1,190	6.6	8,070	1.80	450	2.30	760	3.5	2,040		
28	2.7	1,090	4.8	4,190	1.80	450	2.60	1,000	3.2	1,630		
29	3.2	1,630	4.2	3,120	1.90	500	2.7	1,090	3.1	1,510		
30	5.4	5,380	3.6	2,180	1.80	450	2.60	1,000	3.0	1,400		
31	5.0	4,570			1.85	475	2.55	960				
Mean discharge		2,350		4,650		611		1,110		1,710		924
Second-feet per square mile		1.09		2.16		0.284		0.516		0.795		0.430
Run-off (depth in inches on drainage area)		0.89		2.41		0.33		0.59		0.89		0.34
Maximum		5,380		14,100		1,510		3,460		4,000		1,290
Minimum		1,090		1,400		450		400		960		350
Accuracy		A		B		A		A		A		A

MASTODON FORK OF EAGLE CREEK ABOVE STORAGE DAM.

On June 10, 1909, a gage was placed on Mastodon Fork of Eagle Creek about 300 feet above the storage reservoir of the Eagle Creek hydraulic plant. The rating curve is fairly well defined below 15 second-feet.

A short ditch taps Miller Fork about a mile above its mouth and carries the water around to a small storage reservoir on Mastodon Fork. From there another small ditch carries the water about 2 miles along the left side of Eagle Creek to a pressure box, where a 210-foot head is obtained for hydraulicking. The water is conveyed from the pressure box to the mine (see Pl. VI, *B*) through 4,200 feet of riveted steel pipe. The plant was first put in operation in July, 1908. The system used to elevate the gravels is the same as that employed on Mammoth Creek (see p. 333) and is the first of its kind to be installed in Alaska.

Discharge measurements of Mastodon Fork of Eagle Creek above storage dam in 1908-9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
July 7		1.1	June 10	0.83	9.8
Sept. 6		1.3	23	.88	11.9
			Aug. 13	.65	5.5

Daily gage height, in feet, and discharge, in second-feet, of Mastodon Fork of Eagle Creek above storage dam for 1909.

[Drainage area, 4.1 square miles. Observer, Joseph Sanders.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.67	6.0	0.67	6.0	0.33	0.67
2			.58	4.1	.92	12.9	.25	.25
3			.58	4.1	.78	8.8	.25	.25
4			.58	4.1	.71	7.0	.21	.13
5			.54	3.4	.67	6.0		
6			.58	4.1	.67	6.0		
7			.71	7.0	.75	8.0		
8			.71	7.0	.83	10.2		
9			1.04	17.1	1.00	15.5		
10	0.83	10.2	.75	8.0	.92	12.9		
11	1.08	18.7	.67	6.0	.75	8.0		
12	1.25	26	.67	6.0	.75	8.0		
13	1.17	22	1.00	15.5	.67	6.0		
14	1.08	18.7	1.08	18.7	.62	4.9		
15	1.00	15.5	.92	12.9	.58	4.1		
16	.92	12.9	.75	8.0	.54	3.4		
17	1.33	29	.67	6.0	.54	3.4		
18	1.00	15.5	.58	4.1	.54	3.4		
19	.83	10.2	.54	3.4	.58	4.1		
20	.75	8.0	.54	3.4	.67	6.0		
21	.75	8.0	.50	2.7	.62	4.9		
22	.83	10.2	.46	2.1	.58	4.1		
23	.83	10.2	.46	2.1	.54	3.4		
24	.83	10.2	.46	2.1	.50	2.7		
25	.75	8.0	.46	2.1	.50	2.7		
26	.75	8.0	.46	2.1	.46	2.1		
27	.83	10.2	.42	1.6	.46	2.1		
28	.75	8.0	.50	2.7	.42	1.6		
29	.75	8.0	.83	10.2	.42	1.6		
30	.75	8.0	.75	8.0	.38	1.1		
31			.71	7.0	.33	.67		
Mean discharge		13.1		6.18		5.53		
Second-feet per square mile		3.20		1.51		1.34		
Run-off (depth in inches on drainage area)		2.50		1.74		1.54		
Maximum		29		18.7		15.5		
Minimum		8.0		2.1		0.67		
Accuracy		B		B		B		

FRYINGPAN CREEK BELOW FORKS.

On June 8, 1910, a gage was installed 2 or 3 miles above the mouth and just below the main forks of Fryingpan Creek, at an elevation of approximately 1,850 feet.

The rating curve is not very well defined, and above 8 second-feet the discharges are only approximate.

Discharge measurements of Fryingpan Creek below forks, 1910.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 8	2.02	5.4
27	1.52	2.7

Daily gage height, in feet, and discharge, in second-feet, of Fryingpan Creek below forks (2½ miles above mouth) for 1910.

[Drainage area, 15.9 square miles. Observer, Oscar Morell.]

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
1			2.21	6.7	1.89	4.6	21	2.28	7.2	2.01	5.4		
2			2.08	5.8	1.73	3.8	22	2.50	8.8	2.08	5.8		
3			1.99	5.2	1.66	3.4	23	2.23	6.8	2.12	6.0		
4			1.94	4.9	1.61	3.2	24	2.12	6.0	2.16	6.3		
5			2.21	6.7	1.54	2.8	25	2.00	5.3	2.06	5.7		
6			2.18	6.5	1.50	2.6	26	1.96	5.1	1.52	2.7		
7			2.02	5.4	1.47	2.4	27	1.96	5.1	1.50	2.6		
8	2.02	5.4	1.94	4.9		2.4	28	2.00	5.3	1.48	2.5		
9	2.80	11.2	1.91	4.8		2.3	29	1.98	5.2	1.48	2.5		
10	3.46	17.0	1.86	4.5		2.3	30	2.53	9.0	2.78	11.0		
11	3.25	15.2	2.06	5.7		2.3	31			2.34	7.6		
12		13.6	2.15	6.2		2.2	Mean discharge		8.09		5.50		2.64
13		12.0	2.28	7.2		2.2							
14		10.5	2.08	5.8		2.1	Second-feet per square mile		0.509		0.346		0.166
15		8.9	2.02	5.4	1.38	2.0							
16		7.3	1.93	4.9	1.42	2.2							
17	2.06	5.7	1.84	4.3	1.40	2.1							
18	2.02	5.4	2.19	6.5									
19	1.96	5.1	2.08	5.8									
20	1.94	4.9	2.00	5.3			Run-off (depth in inches on drainage area)		0.40		0.40		0.10
							Maximum		17.0		11.0		4.6
							Minimum		4.9		2.5		2.0
							Accuracy		C		B		B

GREAT UNKNOWN CREEK AT MOUTH.

A gage was installed on Great Unknown Creek June 8, 1912. It was removed by high water June 23, 1912, and was replaced by a new gage July 3, 1912, from which all subsequent readings were made. Different rating curves were used at the two gages. The channel was liable to considerable change during high water. Measuring conditions were not very favorable for accuracy at the station.

Discharge measurements of Great Unknown Creek at mouth in 1910 and 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912—Continued.	*Feet.*	*Sec.-ft.*
July 26		16.7	July 4	3.01	16.0
			Aug. 23	3.01	17.9
1912.			24	3.02	18.2
June 8	3.06	28	Sept. 4	3.27	40
July 3	3.10	22	5	3.28	40

Daily gage height, in feet, and discharge, in second-feet, of Great Unknown Creek at mouth for 1912.

[Drainage area, 41.2 square miles. Observer, F. C. Sutliff.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1						15		20
2					2.75	10.1		25
3			3.10	22		10		30
4			2.98	16.3		10	3.27	40
5			2.90	13.6	2.75	10.1	3.28	41
6				12		10		36
7				11	3.60	104	3.20	31
8	3.06	28		10	3.50	81	3.18	29
9	3.10	33	2.70	9.2	3.15	26		28
10	3.15	40	2.70	9.2		20	3.16	27
11		40	2.68	9.0	3.28	41	3.14	26
12		90	2.70	9.2		38	3.10	22
13	3.60	135		10		35		24
14		120	2.75	10.1		32	3.15	26
15		110		10		29	3.15	26
16		100	2.75	10.1	3.15	26	3.18	29
17		90		10	3.10	22	3.62	109
18	3.40	85		10		21	3.42	65
19	4.20	323	2.75	10.1		20	3.35	52
20	3.80	195		10	3.05	19.5		
21	3.50	109		10		19		
22				10		18		
23			2.75	10.1	3.01	17.5		
24				10	3.01	17.5		
25				10		17		
26			2.75	10.1		17		
27				12		25		
28				20		25		
29				30		20		
30			3.21	32		17		
31			3.15	26		17		
Mean discharge		106		13.2		25.5		36.1
Second-feet per square mile		2.58		0.320		0.619		0.876
Run-off (depth in inches on drainage area)		1.34		0.35		0.71		0.62
Maximum		323		32		104		109
Minimum		28		9.0		10.0		20
Accuracy		D		B		C		C

NOTE.—The rating curve for June records was obtained by means of one discharge measurement and the direction of the curve for the July and subsequent records. It is only approximate.

CLUMS FORK BELOW MUNSON CREEK.

This station was established June 30, 1912, on Clums Fork, just below the junction of Munson and Lawson creeks. The rating curve is not very well defined. The period covered by the records was characterized by a greater discharge than should probably be expected during a normal year.

Discharge measurements of Clums Fork below Munson Creek in 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 30	3.50	37	Aug. 25	3.27	25
July 2	3.38	28	Sept. 3	3.30	28

Daily gage height, in feet, and discharge, in second-feet, of Clums Fork below Munson Creek for 1912.

[Drainage area, 46.4 square miles. Observer, C. N. Banks.]

Day.	July.		August.		September.		Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.45	34		28	3.31	26	21	3.30	26	3.20	23	3.75	64
2	3.38	29		27	3.28	25	22	3.28	25	3.28	25	3.65	52
3	3.30	26		26	3.30	26	23	3.25	24	3.29	26	3.60	46
4	3.30	26	3.28	25	3.30	26	24	3.22	24		26	3.55	42
5	3.28	25	3.25	24	3.28	25	25	3.25	24	3.27	25		
6	3.26	25	3.20	23	3.29	26	26	3.23	24	3.30	26		
7	3.30	26	3.60	46	3.27	25	27	3.50	37	3.35	28		
8	3.27	25	3.44	33	3.28	25	28	3.45	34	3.32	27		
9	3.25	24	3.38	29	3.30	26	29		32	3.30	26		
10	3.62	48	3.36	28	3.30	26	30		30	3.29	26		
11	3.35	28	3.65	52	3.28	25	31		29	3.28	25		
12	3.23	24		46	3.27	25	Mean discharge		27.5		29.8		32.6
13	3.25	24		42	3.26	25	Second-feet per square mile		0.593		0.642		0.703
14	3.38	29		38	3.25	24	Run-off (depth in inches on drainage area)		0.68		0.74		0.63
15	3.28	25		36	3.28	25	Maximum		48		52		66
16	3.27	25		32	3.35	28	Minimum		24		23		24
17	3.25	24	3.35	28	3.46	34	Accuracy		B		B		C
18	3.32	27	3.35	28	3.50	37							
19	3.28	25	3.30	26	3.46	34							
20	3.28	25	3.25	24	3.77	66							

LAWSON CREEK AT MOUTH.

This station was established June 30, 1912, on Lawson Creek, about 300 feet above the mouth of Munson Creek. The rating curve is not very well defined. The discharge during the period covered by the records was probably greater than normal.

Discharge measurements of Lawson Creek at mouth in 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 30	3.15	18.7	Aug. 25	3.03	14.2
July 2	3.08	14.7	Sept. 3	3.04	13.9

Daily gage height, in feet, and discharge, in second-feet, of Lawson Creek at mouth for 1912.

[Drainage area, 21.6 square miles. Observer, C. N. Banks.]

Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.
1	3.13	17.2		15	3.04	14.3
2	3.08	15.4		14	3.02	13.8
3	3.03	14.1		14	3.02	13.8
4	3.02	13.8	3.01	13.6	3.03	14.1
5	3.00	13.3	3.00	13.3	3.02	13.8
6	2.98	12.9	2.98	12.9	3.03	14.1
7	3.00	13.3	3.30	27	3.01	13.6
8	3.00	13.3	3.15	18.1	3.01	13.6
9	3.00	13.3	3.11	16.3	3.03	14.1
10	3.37	35	3.10	15.9	3.02	13.8
11	3.20	20	3.30	27	3.01	13.6
12	3.08	15.4		25	3.02	13.8
13	3.03	14.1		23	3.01	13.6
14	3.12	16.8		21	3.00	13.3
15	3.08	15.4		19	3.04	14.3
16	3.05	14.6		17	3.08	15.4
17	3.02	13.8	3.10	15.9	3.10	15.9
18	3.06	14.9	3.12	16.8	3.11	16.3
19	3.02	13.8	3.10	15.9	3.11	16.3
20	3.02	13.8	3.05	14.6	3.30	27
21	3.04	14.3	3.03	14.1	3.28	26
22	3.02	13.8	3.10	15.9	3.20	20
23	3.02	13.8	3.12	16.8	3.20	20
24	3.00	13.3		15	3.20	20
25	2.98	12.9	3.03	14.1		
26	3.01	13.6	3.06	14.9		
27	3.15	18.1	3.05	14.6		
28	3.15	18.1	3.02	13.8		
29		18	3.02	13.8		
30		17	3.04	14.3		
31		16	3.03	14.1		
Mean discharge		15.6		16.7		16.0
Second-feet per square mile		0.722		0.773		0.741
Run-off (depth in inches on drainage area)		0.83		0.89		0.66
Maximum		35		27		27
Minimum		12.9		12.9		13.3
Accuracy		C		B		B

BUCKLEY BAR CREEK AT MOUTH.

Buckley Bar Creek enters Birch Creek from the north at Buckley Bar, about a mile above Sheep Creek. This station was established June 2, 1911. The gage was located on the left bank about one-eighth mile from Birch Creek and just above the intake to a small ditch carrying water to Buckley Bar. The rating curve is fairly well defined for all stages.

Discharge measurements of Buckley Bar Creek at mouth, 1911.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 2	2.10	25	May 28	1.81	4.4
2	2.14	29	29	2.54	33
July 27	1.14	.45	30	2.20	17.8
30	1.11	.36	July 14	1.47	.63
Aug. 19	1.37	1.5			

NOTE.—Zero of 1912 gage was 0.30 foot below that of 1911.

Daily gage height, in feet, and discharge, in second-feet, of Buckley Bar Creek at mouth for 1911–12.

[Drainage area, 10.6 square miles. Observer, Chas. H. Rogers.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1					1.28	1.0	1.10	0.34	1.23	0.78
2			2.10	25	1.30	1.1		.34		.76
3			1.94	14.5	1.81	9.4	1.10	.34	1.22	.74
4			1.89	12.2	1.71	6.5	1.09	.32	1.22	.74
5			1.86	11.1	1.62	4.6	1.09	.32	1.22	.74
6			1.87	11.4	1.53	3.2	1.09	.32		.74
7			1.77	8.2	1.50	2.8		.33		.76
8			1.70	6.2	1.46	2.4	1.10	.34	1.23	.78
9			1.66	5.4	1.38	1.7	1.09	.32		.80
10			1.60	4.2	1.31	1.2	1.10	.34		.82
11			1.56	3.6	1.30	1.1	1.10	.34	1.24	.83
12			1.52	3.1	1.31	1.2	1.10	.34	1.27	.96
13			1.56	3.6	1.28	1.0	1.10	.34	1.31	1.2
14			1.56	3.6	1.26	.92	1.10	.34	1.32	1.2
15			1.54	3.4	1.25	.88	1.26	.92	1.32	1.2
16			1.50	2.8	1.22	.74	1.42	2.0	1.32	1.2
17			1.70	6.2	1.22	.74		1.9	1.30	1.1
18			1.90	12.5	1.21	.70	1.40	1.8	1.30	1.1
19			1.76	7.9	1.20	.65	1.37	1.6		1.0
20			1.66	5.4	1.20	.65		1.4	1.28	1.0
21			1.52	3.1	1.20	.65	1.30	1.1		
22			1.49	2.7	1.20	.65		.90		
23			1.44	2.2	1.19	.62	1.24	.83		
24			1.41	1.9	1.18	.59	1.23	.78		
25			1.37	1.6	1.16	.52		.76		
26			1.35	1.4	1.16	.52	1.22	.74		
27			1.35	1.4	1.14	.46	1.21	.70		
28			1.34	1.4	1.12	.39		.72		
29			1.30	1.1	1.11	.36	1.22	.74		
30			1.30	1.1	1.11	.36	1.24	.83		
31					1.11	.36	1.23	.78		
Mean discharge				5.61		1.55		0.780		0.922
Second-feet per square mile				0.529		0.146		0.074		0.087
Run-off (depth in inches on drainage area)				0.59		0.17		0.09		0.10
Maximum				25		9.4		2.0		1.2
Minimum				1.1		0.36		0.32		0.74
Accuracy				B		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Buckley Bar Creek at mouth for 1911–12.—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1	....	....	2.30	22	1.70	2.6	....	0.61	1.90	6.3
2	....	....	2.62	39	....	2.2	....	.60	1.96	8.0
3	....	....	2.30	22	1.62	1.7	1.46	.59	....	7.8
4	....	....	....	13.5	1.59	1.4	....	.57	....	7.5
5	....	....	1.84	5.0	....	1.2	1.45	.55	1.93	7.2
6	....	....	1.76	3.6	1.52	.90	....	1.0	1.88	5.9
7	....	....	....	4.0	1.51	.82	1.96	8.0	1.84	5.0
8	....	....	....	4.6	....	.70	1.95	7.8	....	5.0
9	....	....	1.85	5.2	1.48	.67	1.87	5.7	1.93	7.2
10	....	....	1.75	3.4	1.50	.75	....	9.0	....	6.5
11	....	....	1.60	1.5	....	.72	2.11	13.1	....	6.0
12	....	....	1.75	3.4	....	.69	2.51	33	....	5.5
13	....	....	1.80	4.2	....	.66	....	16.0	1.84	5.0
14	....	....	....	4.0	1.47	.63	....	10.0	....	6.0
15	....	....	....	6.0	1.48	.67	....	7.0	1.92	6.9
16	....	....	....	12.0	1.46	.59	....	5.0	....	7.0
17	....	....	....	17.0	1.47	.63	1.84	5.0	....	7.0
18	....	....	....	12.0	....	1.0	1.82	4.6	1.94	7.5
19	....	....	....	22	1.58	1.4	1.79	4.0	....	16.0
20	....	....	....	12.0	1.56	1.2	1.75	3.4	....	25
21	1.70	2.6	1.81	4.4	....	1.2	....	3.2	....	34
22	1.65	2.0	1.95	7.8	....	1.1	1.72	2.9	2.68	43
23	1.88	5.9	2.08	12.0	1.55	1.1	....	2.8	....	....
24	1.76	3.6	2.46	30	....	1.0	1.70	2.6	....	....
25	....	2.8	2.65	41	1.53	.98	....	3.9	....	....
26	1.65	2.0	2.38	26	....	.86	1.85	5.2	....	....
27	....	3.2	1.95	7.8	1.50	.75	1.91	6.6	....	....
28	1.81	4.4	1.86	5.5	1.48	.67	1.85	5.2	....	....
29	2.54	34	1.78	3.9	....	.65	1.72	2.9	....	....
30	2.20	17.0	1.76	3.6	1.47	.63	....	2.8	....	....
31	2.02	9.9	....	....	....	.62	1.70	2.6	....	....
Mean discharge	....	7.95	....	1.19	....	.990	....	5.68	....	10.7
Second-feet per square mile	....	0.750	....	0.112	....	0.093	....	0.536	....	1.01
Run-off (depth in inches on drainage area)	....	0.31	....	0.12	....	0.11	....	0.62	....	.83
Maximum	....	34	....	41	....	2.6	....	33	....	.43
Minimum	....	2.0	....	1.5	....	0.59	....	0.55	....	.50
Accuracy	....	B	....	B	....	B	....	B	....	B

SHEEP CREEK AT MOUTH.

A gage was installed June 2, 1911, on the right bank of Sheep Creek, about 100 feet from Birch Creek.

Only occasional gage readings were obtained, but from the discharges at Birch Creek above Sheep Creek and of Buckley Bar Creek at mouth, where daily records were obtained, the discharge on days of missing gage heights could be estimated with considerable accuracy.

Discharge measurements of Sheep Creek at mouth in 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 2	3.50	101	May 28	3.03	25
July 27	2.45	3.6	29	3.97	154
30	2.42	3.6	July 14	2.76	8.9
Aug. 19	3.20	50			

Daily gage height, in feet, and discharge, in second-feet, of Sheep Creek at mouth for 1911–12.

[Drainage area 46.7 square miles. Observers: G. L. Dalby, 1911; Charles Rogers and B. Lokkan, 1912.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1							2.60	8.2
2	3.50	101						
3					2.38	2.5		
4								
5					2.35	2.0		
6			3.10	38				
7								
8	3.90	208						
9	3.38	78					2.58	7.6
10								
11	3.22	53			2.64	9.8		
12								
13					2.60	8.2		
14					2.65	10.2	2.71	12.7
15			2.60	8.2	3.05	34		
16							2.70	12.2
17								
18	4.05	255						
19					3.20	50	2.91	23
20			2.50	5.1				
21								
22								
23					2.78	16.0		
24	3.21	51						
25								
26								
27			2.45	4.0			2.76	15.1
28	2.95	26						
29					2.65	10.2		
30			2.42	3.3			2.70	12.2
31								

NOTE.—Rating curve is fairly well defined below 150 second-feet.

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Daily gage height, in feet, and discharge, in second-feet, of Sheep Creek at mouth for 1911–12—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1								
2							2.72	6.8
3								
4			3.40	67				
5							2.76	8.3
6								
7							4.12	179
8			3.05	26				
9								
10								
11								
12								
13								
14								
15								
16	3.52	84						
17								
18							3.12	33
19			3.90	142			3.10	31
20	3.52	84			2.80	9.8		
21			3.85	134				
22	3.40	67						
23								
24					2.80	9.8		
25							2.95	18.6
26					2.74	7.5		
27								
28	3.03	25						
29	4.20	193	3.35	60				
30	3.79	124						
31					3.75	118	3.00	22

NOTE.—Rating curve fairly well defined for all stages.

BACHELOR CREEK BELOW COSTA FORK.

This station was established on Bachelor Creek about 1½ miles below Costa Fork on June 8, 1909, but daily gage readings were not commenced until June 25, 1909. The rating curve for 1909 is fairly well defined for all stages. The discharges for 1910 are only approximate because of insufficient measurements and shifting channel.

Below Costa Fork the creek has a grade of about 70 feet per mile. In 1909 about a mile of ditch with the intake a short distance below Costa Fork was partly constructed along the left limit of the creek, in accordance with a plan to mine the Bachelor Creek gravels by hydraulic elevators. The scheme has apparently been abandoned, for nothing has been done since 1909.

Discharge measurements of Bachelor Creek below Costa Fork, 1909–10.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1909.	*Feet.*	*Sec.-ft.*	1910.	*Feet.*	*Sec.-ft.*
June 8	1.82	53	July 11	1.49	6.6
25	1.65	32	12	1.44	5.8
26	1.61	28	30	1.48	8.5
Aug. 15	1.10	10			
16	1.08	8.5			

NOTE.—Zero of 1910 gage was 0.45 foot below that of 1909.

Daily gage height, in feet, and discharge, in second-feet, of Bachelor Creek below Costa Fork for 1909–10.

[Drainage area, 11.4 square miles.]

Day.	1909								1910	
	June.		July.		August.		September.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.44	19.2	1.15	10.2	1.00	7.6		
2			1.41	17.8	1.12	9.6	1.00	7.6		
3			1.42	18.2	1.10	9.2	1.00	7.6		
4			1.42	18.2	1.10	9.2	1.00	7.6		
5			1.44	19.2	1.10	9.2	1.00	7.6		
6			1.41	17.8	1.08	8.9	1.00	7.6		
7			1.38	16.6	1.08	8.9	1.00	7.6		
8			1.32	14.5	1.11	9.4	1.00	7.6		
9			1.32	14.5	1.16	10.4	1.00	7.6		
10			1.38	16.6	1.20	11.2	1.98	7.3		
11			1.35	15.6	1.18	10.8	.98	7.3	1.49	6.6
12			1.26	12.8	1.15	10.2	.98	7.3	1.48	6.4
13			1.42	18.2	1.10	9.2	.98	7.3	1.44	5.9
14			1.41	17.8	1.10	9.2	.98	7.3	1.40	5.3
15			1.42	18.2	1.10	9.2	.98	7.3	1.39	5.2
16			1.38	16.6	1.10	9.2			1.38	5.0
17			1.31	14.2	1.08	8.9			1.42	5.6
18			1.64	30	1.05	8.4			1.60	8.5
19			1.50	22	1.05	8.4			1.49	8.2
20			1.32	14.5	1.05	8.4			1.46	7.8
21			1.24	12.2	1.05	8.4			1.45	7.6
22			1.20	11.2	1.05	8.4				
23			1.61	29	1.02	7.9				
24			1.25	12.5	1.02	7.9				
25	1.65	31	1.25	12.5	1.02	7.9			1.48	8.1
26	1.60	28	1.20	11.2	1.02	7.9			1.45	7.6
27	1.52	23	1.16	10.4	1.02	7.9			1.44	7.4
28	1.48	21	1.15	10.2	1.02	7.9			1.42	7.1
29	1.46	20	1.14	10.0	1.00	7.6			1.41	7.0
30	1.45	19.6	1.15	10.2	1.00	7.6			1.48	8.5
31			1.15	10.2	1.00	7.6				
Mean discharge		24		15.9		8.9		7.5		6.9
Second-feet per square mile		2.11		1.39		0.78		0.66		0.61
Run-off (depth in inches on drainage area)		0.47		1.60		0.90		0.37		0.39
Maximum		31		30		11.2		7.6		8.5
Minimum		19.6		10.0		7.6		7.3		5.0
Accuracy		B		B		B		B		C

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Birch Creek drainage basin, 1908 to 1912:

Miscellaneous measurements in Birch Creek drainage basin for 1908–1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
July 9, 1908	Ptarmigan Creek	Birch Creek	Mouth	26.2	19	1.38
Sept. 5, 1908	do	do	do	24.7	19	1.30
June 24, 1909	do	do	do	34	19	1.79
Aug. 14, 1909	do	do	do	27	19	1.42
July 28, 1910	do	do	do	15.0	19	.79
July 18, 1911	do	do	do	4.6	19	.24
June 6, 1912	do	do	do	29	19	1.53
July 18, 1912	do	do	do	5.0	19	.26
Aug. 18, 1912	do	do	do	15.6	19	.82
Sept. 6, 1908	Eagle Creek	do	Below Mastodon Fork	[a] 4.2	8.4	
July 7, 1908	do	do	Below Cripple Creek	10.5	12.4	.85
July 9, 1908	do	do	Mouth	15.4	15.5	.99
Sept. 5, 1908	do	do	do	24.7	15.5	1.59
June 24, 1909	do	do	do	19.4	15.5	1.25
Aug. 14, 1909	do	do	do	22	15.5	1.42
June 6, 1912	do	do	do	17.0	15.5	1.09
Sept. 6, 1908	Miller Fork of Eagle Creek.	Eagle Creek	Above ditch intake	2.1	2.6	.81
June 10, 1909	do	do	do	9.9	2.6	3.81
Sept. 6, 1908	Miller Fork ditch		Intake	2.8		
Do	do		Outlet	1.4		
July 27, 1910	Golddust Creek	Birch Creek	4½ miles above mouth	8.6	9.5	.90
July 5, 1912	do	do	3 miles above mouth	5.0	10.0	.50
June 24, 1909	do	do	Mouth	15.9	13.6	1.17
Aug. 14, 1909	do	do	do	15.7	13.6	1.15
July 18, 1911	do	do	do	3.6	13.6	.38
July 18, 1912	do	do	do	6.9	13.6	.51
Aug. 18, 1912	do	do	do	9.3	13.6	.68
June 24, 1909	Fish Creek	do	do	6.6	6.0	1.10
Aug. 14, 1909	do	do	do	7.1	6.0	1.18
July 18, 1912	do	do	do	.52	6.0	.087
Aug. 18, 1912	do	do	do	3.1	6.0	.52
Aug. 14, 1909	Butte Creek	do	do	5.6	9.2	.61
July 28, 1910	do	do	do	2.2	9.2	.24
July 18, 1911	do	do	do	3.5	9.2	.38
July 18, 1912	do	do	do	5.5	9.2	.60
Aug. 18, 1912	do	do	do	6.2	9.2	.67
July 9, 1908	Bear Creek	do	do	20.3	11.6	1.75
June 24, 1909	do	do	do	21	12.4	1.69
Aug. 14, 1909	do	do	do	12.9	12.4	1.04
July 28, 1910	do	do	do	6.7	12.4	.54
July 18, 1911	do	do	do	4.3	12.4	.35
June 6, 1912	do	do	do	14.0	12.4	1.13
July 18, 1912	do	do	do	2.5	12.4	.20
Aug. 18, 1912	do	do	do	7.2	12.4	.58
July 10, 1908	Twelvemile Creek	do	5 miles above mouth	6.3	10.4	.61
July 11, 1908	do	do	do	6.0	10.4	.58
Aug. 14, 1909	do	do	do	4.6	10.4	.44
July 11, 1908	do	do	Between North and South forks.	15.6	23	.68
June 24, 1909	do	do	do	17.6	23	.77
Aug. 14, 1909	do	do	do	19.5	23	.85
July 17, 1911	do	do	do	5.9	23	.26
Aug. 3, 1911	do	do	do	[b] 4.3	23	.19
Aug. 14, 1911	do	do	do	4.8	23	.21
June 8, 1912	do	do	do	14.3	23	.62
Aug. 17, 1912	do	do	do	6.8	23	.30
July 11, 1908	do	do	Mouth	38	44.5	.85
Sept. 4, 1908	do	do	do	73	44.5	1.64
July 13, 1910	do	do	do	18.9	44.5	.42
July 28, 1910	do	do	do	14.6	44.5	.33
July 10, 1908	North Fork Twelvemile Creek.	Twelvemile Creek.	do	24.4	22.9	1.07
Sept. 4, 1908	do	do	do	23.9	22.9	1.04

[a] Some water was diverted past the section by the ditch from Miller and Mastodon forks; this measurement shows the seepage from the diversion dams and ditches.

[b] These measurements probably indicate about the minimum run-off for the season.

Miscellaneous measurements in Birch Creek drainage basin for 1908–1912—Continued.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
June 24, 1909	North Fork Twelvemile Creek.	Twelvemile-Creek.	Mouth	51	22.9	2.23
Aug. 14, 1909	do	do	do	18.5	22.9	.81
June 9, 1910	do	do	do	60	22.9	2.62
July 13, 1910	do	do	do	7.4	22.9	.32
July 28, 1910	do	do	do	9.2	22.9	.40
July 17, 1911	do	do	do	5.5	22.9	.24
Aug. 3, 1911	do	do	do	*a* 2.6	22.9	.11
Aug. 14, 1911	do	do	do	7.5	22.9	.33
June 8, 1912	do	do	do	23	22.9	1.00
Aug. 17, 1912	do	do	do	7.7	22.9	.34
July 19, 1912	Harrington Fork	do	Above Crooked Creek.	13.2	44.7	.30
Do	Crooked Creek	Harrington Fork.	Mouth	6.5	33.3	.20
July 3, 1912	Acme Creek	Birch Creek	2 miles above mouth	7.0	27.7	.25
Aug. 25, 1912	do	do	do	3.8	27.7	.14
July 3, 1912	Clums Fork	do	Below Bear Creek	70	106	.66
Aug. 25, 1912	do	do	do	62	106	.58
July 25, 1910	do	do	Mouth	118	172	.69
Aug. 1, 1911	do	do	do	*a* 24	172	.14
July 3, 1912	Bear Creek	Clums Fork	do	32	34.7	.92
Aug. 25, 1912	do	do	do	30	34.7	.87
July 25, 1910	McLean Creek	Birch Creek	do	3.0	15.4	.20
July 30, 1911	Wolf Creek	do	1 mile above mouth	*a* 4.2	50.8	.083
July 8, 1908	Harrison Creek	do	Elevation 2,200 feet	4.9	17.9	.27
July 22, 1909	do	do	Above North Fork	19.1	21.6	.88
Do	do	do	Below North Fork	52	47.3	1.10
July 8, 1908	North Fork	Harrison Creek.	Elevation 2,600 feet	7.1	6.2	1.15
Aug. 13, 1909	do	do	Claim "No. 10 above"	15.7	6.3	2.49
June 13, 1909	do	do	Claim "No. 5 above"	108	11.4	9.47
Do	do	do	do	96	11.4	8.42
June 11, 1909	do	do	do	49	11.4	4.30
June 22, 1909	do	do	do	28	11.4	2.46
June 23, 1909	do	do	do	17.9	11.4	1.57
July 22, 1909	do	do	Mouth	36	25.1	1.43
July 27, 1911	South Fork	Birch Creek	Above Big Windy Creek.	*a* 24	217	.11
Do	do	do	Below Big Windy Creek.	*a* 53	320	.17
Do	Big Windy Creek	South Fork of Birch Creek.	Mouth	*a* 26	99.2	.26
July 29, 1910	Preacher Creek	do	Above Bachelor Creek.	45	94.7	.48
Aug. 15, 1909	do	do	Below Bachelor Creek.	115	121	.95
Do	Bachelor Creek	Preacher Creek.	Mouth	16.4	26.4	.62
July 29, 1910	do	do	do	7.6	26.4	.29
July 11, 1910	Costa Fork	Bachelor Creek.	do	2.1	4.5	.47

a These measurements probably indicate about the minimum run-off for the season.

CROOKED CREEK DRAINAGE BASIN.

DESCRIPTION.

Crooked Creek, which is formed by the junction of Mammoth and Porcupine creeks, meanders through a rather broad valley for about 30 miles and discharges its waters into Birch Creek about 10 miles above Fourteenmile House. Not far below Central House the valley loses its identity in the flats of Birch Creek.

Mastodon and Independence creeks unite to form Mammoth Creek, which receives Miller Creek from the west about 2 miles below the junction. The total length of that portion of the stream called Mammoth Creek is less than 4 miles.

Mastodon Creek (see Pl. VI, *A*) is the most important gold-producing stream in the Circle district. Its water supply is very small but is exceedingly important for local use. Three small hydraulic plants have been installed on the creek. They have sufficient water to operate only a small part of the time but can be used to a good advantage to strip the ground and prepare it for other methods of recovering the gold.

Deadwood and Boulder creeks are tributaries from the south, below and above Central House, respectively. They follow parallel courses about 3 miles apart and are each about 18 miles long.

Albert Creek, the principal tributary from the north, drains the southern slope of the Crazy Mountains.

Portage Creek rises in the divide between Birch and Crooked creeks, about 10 miles east of Deadwood Creek. It flows northeast for about 8 miles to Medicine Lake.

Placer mining in the Circle district is largely confined to the tributaries of Crooked Creek. Most of the richer claims are now worked out and the problem of obtaining water for hydraulicking the low-grade ground is particularly difficult. Dredging or other methods requiring relatively small quantities of water to recover the gold may have to be resorted to. The run-off from the area is less than from adjoining areas. The creeks are liable to a very low minimum discharge and, owing to the steep barren slopes, are flashy in character. Nearly all the timber in the headwaters has been cut off and much of the basin has been burned over.

PORCUPINE CREEK ABOVE DITCH INTAKE.

Porcupine Creek rises on the north slope of Porcupine Dome. Its headwater tributaries interlock with those of Loper and Willow creeks at an elevation of 4,000 to 5,000 feet. It flows east for about 14 miles and unites with Mammoth Creek to form Crooked Creek. Its valley is extremely asymmetric; the north side is steep and narrow and uncut by any streams of consequence; the south slope is more gradual and contributes most of the drainage. Considerable spruce grows along the banks of the stream and on the northern slope. On the south the basin is nearly devoid of all tree growth.

Bonanza Creek, the largest tributary of Porcupine Creek, enters it about 4 miles above its mouth. Its upper basin is rather steep and barren and causes wide fluctuations in stream flow. Large bodies of ice accumulate in the stream bed during the winter and aid slightly in keeping up the flow early in the summer. The water for the hydraulic plant on Mammoth Creek (see p. 333) is diverted from Porcupine and Bonanza creeks at an elevation of about 2,350 feet and is conducted to the left bank of Mammoth Creek by a ditch 10.3 miles long. The lower part of the ditch, below the Bonanza intake, was constructed in 1908 and 1909 and is 6.5 miles long with a bottom width of 7 feet and a grade of 5 feet per mile. The upper section, between Bonanza and Porcupine creeks, was completed in 1910. Some of the construction methods used were described in a previous report,[1] as follows:

Much difficulty was experienced in completing this section of the ditch on account of ground ice along the steep slopes near the Porcupine intake. Wherever the ditch line crossed these pockets of nearly clear ice, the ice was kept exposed to the open air and a drain provided to expedite thawing. This process of thawing quickly opened up a good-sized hole in the side of the hill, and when it was possible to provide a good foundation the space below the ditch was filled in with layers of moss and dirt. This ditch was built to a grade of 5.3 feet per mile, with a width of 6.5 feet on the bottom. The usual form of construction, which consists of making the bottom of a ditch level, was not followed in building the upper ditch. The method adopted constitutes digging the side next to the hillside five-tenths deeper than the embankment side. When carrying water, a ditch with this cross section will have its greatest depth next to the hillside, and as the highest velocity of a stream or ditch is usually at the deepest section it is thought that the tendency of the water to cut the embankment will thus be decreased.

The thawing of ground ice beneath the bottom of the ditch and seepage through loose rock soil has been a continual source of trouble along the lower ditch. These troubles have been described as follows:[2]

The ditch was built along the hillside, and as the ice in the bottom thawed the water followed the line of thaw until often it finally escaped to the surface below the lower bank. Unless these underground channels were soon discovered and moss was tamped into the openings in the bottom of the ditch, they rapidly wore larger and frequently only a few hours were required before the whole outside bank of the ditch near the break was groundsluiced away. In many places where the bottom of the ditch was impervious the outer bank, which is mostly in fill, settled and slid, and if allowed to fall below the water level the overflowing water did considerable damage if not immediately stopped. Moss sod was generally used for repair work. In repairing the large breaks the bottom and sides were built up with soil and then lined with sod. Moss was thoroughly tamped into all holes and crevices in the bottom and then puddled with clay. In repairing the settling bank the sod was cut in rectangular strips and successive layers were placed and tamped as the settling proceeded. In some places this settling and rebuilding continued to such an extent that very little, if any, of the original fill could be seen.

In order to determine the water available for diversion a gage was placed in the creek about 100 feet above the intake to the ditch on June 6, 1910. Daily readings were obtained from July 4 to August 18, 1910. A dam which was later constructed caused backwater on the gage and the station was abandoned.

[1] Ellsworth, C. E., and Parker, G. L., Placer mining in the Yukon-Tanana region: U. S. Geol. Survey Bull. 480, pp. 161-162, 1911.

[2] Ellsworth, C. E., Placer mining in the Yukon-Tanana region: U. S. Geol. Survey Bull. 442, p. 236, 1910.

Discharge measurements of Porcupine Creek above ditch intake in 1908–1911.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1910.	*Feet.*	*Sec.-ft.*
July 6		12.6	June 6		25
			July 15	0.36	3.3
1909.			22	.51	10.2
Aug. 12		25	1911.		
			July 20		2.7

Daily gage height, in feet, and discharge, in second-feet, of Porcupine Creek above ditch intake for 1910.

[Drainage area, 17.8 square miles. Observer, Frank Miller.]

Day.	July.		August.		Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1			0.79	23	21	0.58	12.8		
2			.68	17.7	22	.52	10.1		
3			.55	11.4	23	.50	9.2		
4	0.50	9.2	.55	11.4	24	.56	11.9		
5		14	.49	8.8	25	.55	11.4		
6		11	.45	7.1	26	.51	9.6		
7	.40	5.0	.44	6.7	27	.48	8.4		
8	.40	5.0	.44	6.7	28	.45	7.1		
9	.35	3.7	.41	5.4	29	.45	7.1		
10	.40	5.0	.40	5.0	30	1.48	62		
					31	1.12	41		
11	.38	4.5	.38	4.5					
12	.35	3.7	.36	4.0					
13	.35	3.7	.36	4.0	Mean discharge		12.3		7.43
14	.36	4.0	.35	3.7					
15	.36	4.0	.35	3.7	Second-feet per square mile		0.691		0.417
16	.32	2.9	.35	3.7					
17		3.0	.33	3.2	Run-off (depth in inches on drainage area)		0.80		0.28
18	.92	30	.35	3.7	Maximum		62		23
19	.85	27			Minimum		2.9		3.2
20	.68	17.7			Accuracy		B		B

NOTE.—Discharges above 15 second-feet are only approximate.

PORCUPINE CREEK BELOW DITCH INTAKE.

This station was established June 2, 1912. The gage was located about 200 feet below the intake dam. The natural flow of the creek at this point can be obtained by adding the discharge of the Porcupine ditch at the intake. The records are only approximate during medium stages, but show fairly accurately the periods when the entire flow was being diverted.

Discharge measurements of Porcupine Creek below ditch intake in 1912.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 2	3.01	75
Sept. 7	1.89	5.0

NOTE.—Zero discharge at about gage height 1.5.

Daily gage height, in feet, and discharge, in second-feet, of Porcupine Creek below ditch intake for 1912.

[Drainage area, 17.8 square miles. Observer, Frank Miller.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1				0		0	1.85	4.2
2	3.02	75		0		0	2.25	15.4
3		55		0		0	2.22	14.3
4	2.61	35		0		0	2.12	10.7
5	2.18	12.8		0		0	2.02	8.0
6	1.78	2.9		0		0	1.85	4.2
7	1.70	1.6		0		0	1.78	2.9
8		0		0		0	1.68	1.4
9		0		0		0	1.70	1.6
10		0		0		0	1.70	1.6
11		0		0	2.50	27	1.60	.6
12	1.90	5.1		0	2.40	22	1.55	.3
13	2.50	27		0	2.20	13.5		0
14	2.60	34		0	1.92	5.6		0
15	2.98	71		0		0		0
16	3.40	121		0		0	2.50	27
17	2.85	56		0		0	2.40	22
18	2.60	34		0		0	2.48	26
19	2.88	60		0		0	2.32	18.3
20	2.85	56		0		0	2.25	15.4
21	2.25	15.4		0		0		
22	2.85	56		0		0		
23	4.15	214		0		0		
24	4.75	295		0		0		
25	4.25	228		0		0		
26	2.68	40		0		0		
27	2.32	18.3		0		0		
28	1.80	3.2		0		0		
29	1.50	0		0		0		
30		0		0		0		
31				0		0		
Mean discharge		52.3		0		2.19		8.70

NOTE.—The discharge rating curve for this station is fairly well defined below 75 second-feet.

PORCUPINE CREEK BELOW BONANZA CREEK.

This station was established July 4, 1908. The gage was located about 300 feet below the mouth of Bonanza Creek. The channel conditions were fairly stable during periods of medium and low water, but at times of high water radical changes have taken place, and several different rating tables have been used in estimating the discharges. The gage datum has remained constant.

Discharge measurements of Porcupine Creek below Bonanza Creek in 1908–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
1908.			1910.			1912.		
July 4	1.55	25	May 29	1.90	24	June 2	2.55	141
6	1.58	26	June 5	2.18	59	July 5	.82	1.0
Sept. 7	1.70	39	July 15	1.48	9.7	Aug. 19	.83	1.4
			22	1.51	13.2	Sept. 7	1.08	10.1
1909.								
June 11	2.70	246	1911.					
21	2.30	64	June 5	1.98	50			
Aug. 11	1.98	32	July 20	1.29	1.6			
			20	1.35	2.8			
			Aug. 16	1.30	1.6			

Daily gage height, in feet, and discharge, in second-feet, of Porcupine Creek below Bonanza Creek for 1908–1912.

[Drainage area 39.9 square miles. Observer, Frank Miller.]

Day.	1908 [a]				1909 [b]							
	July.		August.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.37	16.1				19	1.82	21	1.67	13.7
2			1.37	16.1				18	1.82	21	1.66	13.3
3			1.32	14.6				24	1.88	25	1.64	12.5
4	1.55	25	1.30	14.0			1.75	17.5	1.82	21	1.64	12.5
5	1.53	24	1.29	13.7			1.72	16.0	1.80	20	1.62	11.6
6	1.79	46	1.30	14.0			1.66	13.3	1.77	18.5	1.61	11.2
7	2.26	121	1.28	13.5			1.96	30	1.78	19.0	1.60	10.8
8	2.10	90	1.32	14.6			2.12	44	1.86	24	1.60	10.8
9	1.95	67	1.48	21			2.36	72	2.06	38	1.60	10.8
10	1.85	54	1.50	22			2.14	46	2.14	46	1.60	10.8
11	1.90	60			2.70	246	2.00	33	2.00	33	1.58	10.0
12	1.72	39			2.90	335	1.94	29	1.96	30	1.60	10.8
13	1.64	32			2.70	246	2.74	153	1.92	27	1.60	10.8
14	1.72	39			2.68	240	2.56	109	1.91	27	1.60	10.8
15	1.76	43			2.78	164	2.58	113	1.78	19.0	1.60	10.8
16	1.72	39			2.60	117	2.24	57	1.73	16.5		
17	1.68	35			2.60	117	2.00	33	1.70	15.0		
18	1.61	29			2.50	96	1.95	30	1.70	15.0		
19	1.52	23			2.40	78	1.84	22	1.70	15.0		
20	1.49	22			2.35	71	1.73	16.5	1.70	15.0		
21	1.44	19.0			2.32	67	1.68	14.2	1.70	15.0		
22	1.40	17.0				66	1.70	15.0	1.70	15.0		
23	1.42	18.0			2.30	64	1.64	12.5	1.68	14.2		
24	1.50	22			2.25	58	1.62	11.6	1.66	13.3		
25	1.51	23			2.22	54	1.61	11.2	1.64	12.5		
26	1.48	21			2.19	51	1.60	10.8	1.62	11.6		
27	1.46	20				47	1.64	12.5	1.62	11.6		
28	1.44	19.0				43	1.69	14.6	1.60	10.8		
29	1.44	19.0				39	1.86	24	1.60	10.8		
30	1.42	18.0				35	1.86	24	1.60	10.8		
31	1.40	17.0					1.90	26	1.58	10.0		
Mean discharge		35.8		16.0		112		34.6		19.4		11.4
Second-feet per square mile		0.897		0.401								
Run-off (depth in inches on drainage area)		0.93		0.15								
Maximum		121		22								
Minimum		17.0		13.5								
Accuracy		B		B		C		B		A		A

[a] No water diverted above gage.

[b] The discharges for 1909 do not include water diverted above gage and as no daily records of such diversion are available the natural discharge for 1909 can not be determined.

Daily gage height, in feet, and discharge, in second-feet, of Porcupine Creek below Bonanza Creek for 1908–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.[a]										
1			2.32	77	1.76	24	1.87	30	1.42	9.2
2			2.23	65	1.66	18.2	1.73	22	1.42	9.2
3			2.32	77	1.58	14.8	1.64	17.3	1.41	8.8
4			2.22	64	1.50	12.0	1.58	14.8	1.40	8.5
5			2.14	54	1.77	24	1.48	11.3	1.48	11.3
6			2.10	50	1.72	21	1.48	11.3	1.54	13.4
7			1.99	39	1.60	15.5	1.55	13.8	1.54	13.4
8			1.92	34	1.52	12.7	1.51	12.4	1.52	12.7
9			2.13	53	1.49	11.6	1.48	11.3	1.51	12.4
10			2.43	96	1.46	10.6	1.46	10.6	1.50	12.0
11			2.26	69	1.42	9.2	1.46	10.6	1.50	12.0
12			2.17	58	1.41	8.8	1.42	9.2	1.50	12.0
13			2.06	46	1.40	8.5	1.42	9.2	1.48	11.3
14			1.95	36	1.38	8.0	1.40	8.5	1.50	12.0
15			1.95	36	1.48	11.3	1.38	8.0	2.05	45
16			2.03	43	1.44	9.9	1.40	8.5	2.06	46
17			1.97	38	1.46	10.6	1.40	8.5	1.98	38
18			1.86	30	2.10	50	1.41	8.8	1.89	31
19			1.92	34	1.82	27	1.40	8.5	1.81	27
20			2.05	45	1.66	18.2	1.43	9.6	1.72	21
21			2.56	125	1.59	15.2		9.5		
22			2.51	112	1.52	12.7		9.4		
23			2.22	64	1.50	12.0	1.42	9.2		
24			1.88	31	1.58	14.8	1.42	9.2		
25			1.81	27	1.57	14.4	1.42	9.2		
26			1.78	25	1.50	12.0	1.45	10.2		
27			1.89	31	1.46	10.6	1.47	11.0		
28			1.94	35	1.56	14.1	1.46	10.6		
29	2.04	35	2.14	54	1.68	19.1	1.44	9.9		
30	2.21	53	1.98	38	2.54	120	1.43	9.6		
31	2.44	85			2.12	52	1.42	9.2		
Mean discharge		57.7		52.9		20.1		11.3		18.3
Accuracy		C		C		B		A		A
1911.[a]										
1					2.52	148	1.29	1.5	1.28	1.3
2					2.38	118	1.28	1.3	1.28	1.3
3					2.58	162	1.30	1.7	1.28	1.3
4					2.50	144	1.28	1.3	1.28	1.3
5			2.10	67	2.44	131	1.28	1.3	1.28	1.3
6			2.38	118	2.32	106	1.28	1.3	1.31	2.0
7			2.18	81	2.28	98	1.28	1.3	1.30	1.7
8			2.12	70	1.98	50	1.27	1.1	1.30	1.7
9			2.08	64	1.79	28	1.27	1.1	1.29	1.5
10			1.95	46	1.61	14.7	1.28	1.3	1.30	1.7
11			1.88	38	1.66	18.2	1.26	.9	1.31	2.0
12			1.90	40	1.74	24	.26	.9	1.30	1.7
13			2.09	66	1.64	16.8	1.28	1.3	1.31	2.0
14			2.08	64	1.55	11.1	1.28	1.3	1.48	7.7
15			2.28	98	1.48	7.7	1.30	1.7		
16			2.22	88	1.34	2.7	1.30	1.7		
17			2.24	91	1.41	4.7	1.42	5.1		
18			2.22	88	1.40	4.3	1.64	16.8		
19			2.23	89	1.30	1.7	1.53	10.2		
20			2.02	55	1.34	2.7	1.44	6.0		
21			2.00	52	1.39	4.0	1.30	1.7		
22			1.92	42	1.38	3.8	1.30	1.7		
23			1.94	45	1.36	3.3	1.28	1.3		
24			1.88	38	1.40	4.3	1.28	1.3		
25			1.80	29	1.40	4.3	1.28	1.3		
26			1.76	26	1.40	4.3	1.28	1.3		
27			1.82	31	1.39	4.0	1.28	1.3		
28			1.70	21	1.40	4.3	1.26	.9		
29			1.80	29	1.35	3.0	1.28	1.3		
30			2.02	55	1.30	1.7	1.28	1.3		
31					1.28	1.3		1.3		
Mean discharge				58.9		36.5		2.38		2.04
Accuracy				B		B		A		A

[a] To determine the natural discharge for 1910 and 1911 add the discharge of Bonanza ditch at intake.

Daily gage height, in feet, and discharge, in second-feet, of Porcupine Creek below Bonanza Creek for 1908–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
1912.								
1	....	....	0.90	3.0	....	0.8	....	13.0
2	2.55	142	.90	3.0	....	.8	1.30	23
3	2.55	142	.88	2.6	....	.8	1.40	30
4	2.10	67	.86	2.1	....	.8	1.35	26
5	1.48	7.6	.84	1.7	0.80	.8	1.25	19.8
6	1.42	5.2	.83	1.5	....	.8	1.18	15.5
7	1.40	4.4	.80	.8	....	.8	....	12.3
8	1.37	3.5	.80	.8	....	.8	....	9.0
9	1.35	2.9	.80	.8	....	.8	.97	5.8
10	1.35	2.9	.80	.8	.80	.8	1.00	7.0
11	1.32	2.0	.80	.8	1.50	39	....	5.7
12	1.35	2.9	.80	.8	1.40	30	....	4.4
13	1.80	29	.80	.8	1.25	19.8	....	3.1
14	1.85	34	.80	.8	....	13.4	.85	1.9
15	1.80	29	.80	.8	1.00	7.0	....	16
16	2.60	150	.78	.7	.90	3.0	1.40	30
17	2.20	83	.80	.8	....	2.4	....	46
18	2.75	176	.80	.8	.85	1.9	1.70	61
19	2.10	67	.80	.8	....	1.3	....	50
20	1.68	19.6	.80	.8	.80	.8	1.50	39
21	1.55	11.2	.80	.8	....	.8	....	....
22	2.20	83	.80	.8	....	.8	....	....
23	3.4	297	.80	.8	....	.8	....	....
24	3.1	320	.80	.8	....	.8	....	....
25	2.8	251	.80	.8	.80	.8	....	....
26	2.2	133	....	.8	....	.8	....	....
27	1.85	81	....	.8	....	1.9	....	....
28	1.35	26	....	.8	.90	3.0	....	....
29	1.00	7.0	....	.8	.90	3.0	....	....
30	.92	3.8	.80	.8	....	3.0	....	....
31	....	....	....	.8	....	3.0	....	....
Mean discharge	....	75.3	....	1.09	....	4.69	....	20.9
Accuracy	....	D	....	A	....	B	....	B

[a] To determine the natural discharge for 1911 add the discharge of the Bonanza ditch at intake.

NOTE.—Channel shifted considerably on June 23 and 24. New rating applied, beginning June 24. Old rating only approximate. New rating curve well defined below 15 second-feet.

To obtain the natural flow for 1912 add the discharge of Bonanza ditch below junction with Porcupine branch.

CROOKED CREEK AT CENTRAL HOUSE.

This station was established June 15, 1909. The creek divides a short distance above the gage, which is located in the main channel. This channel carries all the flow at low and medium stages. The relation between gage height and discharge has not remained constant. Channel conditions have changed to some extent and the gage datum has varied slightly from year to year. Sufficient measurements, however, have been made, so that each year, with the exception of 1909, the rating curve has been fairly well defined, and it is improbable that any large errors have been introduced.

The minimum discharge recorded at this station was 4.5 second-feet and occurred from August 5 to 15, 1911. Beneath the creek bed there is probably considerable thawed gravel, through which most of the low-water flow passes.

Discharge measurements of Crooked Creek at Central House in 1908–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1910.	*Feet.*	*Sec.-ft.*	1911—Contd.	*Feet.*	*Sec.-ft.*
June 30		58	May 30	1.59	208	Aug. 17	0.62	27
July 1		52	31	1.82	311	21	.55	28
Sept. 9		86	July 17	.66	30			
			19	1.50	172	1912.		
1909.			20	1.35	122	May 26	1.25	101
June 15	1.82	319				31	1.52	187
20	1.68	239	1911.			July 7	.66	21
Aug. 9	1.30	143	May 29	1.78	306	13	.56	12.2
10	1.45	165	31	1.58	230	15	.49	9.1
			July 23	.32	12.5	Sept. 9	1.06	65
			25	.25	10.0			

Daily gage height, in feet, and discharge, in second-feet, of Crooked Creek at Central House for 1909–1912.

[Drainage area, 161 square miles. Observers: H. A. Stade, 1909, 1911–12; W. H. Bayless, 1910.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.								
1			1.28	138	1.28	138	0.35	63
2			1.15	122	1.18	126	.30	60
3			1.05	113	1.20	128	.25	58
4			1.20	128	1.35	149	.20	55
5			1.20	128	1.20	128	.10	50
6			1.20	128	1.08	115	.00	45
7			1.25	134	.98	107		
8			1.42	162	1.05	113		
9			1.65	228	1.30	140		
10			1.52	186	1.42	162		
11			1.40	158	1.38	154		
12			1.32	144	1.28	137		
13			2.75	1,170	1.22	130		
14			2.20	635	1.18	126		
15	1.80	305	2.32	744	1.08	115		
16	1.90	380	1.78	294	.98	107		
17	1.50	180	1.45	169	.92	103		
18	1.95	420	1.30	140	.88	99		
19	1.85	342	1.20	128	.80	93		
20	1.65	228	1.05	113	.92	103		
21	1.50	180	1.00	109	1.02	111		
22	1.45	169	.85	97	1.05	113		
23	1.38	154	.80	93	.88	99		
24	1.62	216	.80	93	.78	91		
25	1.55	194	.68	84	.68	84		
26	1.65	228	.65	82	.68	84		
27	1.58	202	.55	75	.72	87		
28	1.58	202	.65	82	.62	79		
29	1.45	169	1.28	138	.52	73		
30	1.32	144	1.18	126	.45	69		
31			1.28	138	.40	66		
Mean discharge		232		202		111		55
Second-feet per square mile		1.44		1.25		0.69		0.34
Run-off (depth in inches on drainage area)		0.86		1.44		0.80		0.08
Maximum		420		1,170		162		63
Minimum		144		75		66		45
Accuracy		C		C		C		C

Daily gage height, in feet, and discharge, in second-feet, of Crooked Creek at Central House for 1909-1912—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1	....	....	1.40	139	1.90	348	1.50	173
2	....	....	1.50	173	1.50	173	1.20	91
3	....	....	1.63	225	1.30	112	1.10	74
4	....	....	1.65	234	1.10	74	1.00	61
5	....	....	1.35	126	1.30	112	.90	50
6	....	....	1.40	139	1.55	192	.85	45
7	....	....	1.30	112	1.30	112	.70	32
8	....	....	1.25	102	1.10	74	.65	29
9	....	....	1.20	91	1.05	68	....	....
10	....	....	1.80	300	1.00	61	....	....
11	....	....	1.70	255	.95	56	....	....
12	....	....	1.60	212	.90	50	....	....
13	....	....	1.50	173	.85	45	....	....
14	....	....	1.40	139	.80	40	....	....
15	1.50	173	1.30	112	....	36	....	....
16	1.50	173	1.25	102	....	33	....	....
17	1.30	112	1.30	112	.67	30	....	....
18	1.25	102	1.25	102	1.70	255	....	....
19	1.20	91	1.15	82	1.50	173	....	....
20	1.30	112	1.10	74	1.35	126	....	....
21	1.35	126	1.30	112	1.25	102	....	....
22	1.40	139	1.90	348	1.30	112	....	....
23	1.30	112	1.70	255	1.35	126	....	....
24	1.40	139	1.50	173	1.30	112	....	....
25	1.60	212	1.30	112	1.20	91	....	....
26	1.30	112	1.20	91	1.10	74	....	....
27	1.10	74	1.20	91	1.00	61	....	....
28	....	50	1.50	173	.90	50	....	....
29	1.50	173	2.00	397	.80	40	....	....
30	1.65	234	2.10	448	.70	32	....	....
31	1.80	300	....	....	1.60	212	....	....
Mean discharge	....	143	....	173	....	103	....	69.4
Second-feet per square mile	....	0.888	....	1.07	....	0.640	....	0.431
Run-off (depth in inches on drainage area)	....	0.56	....	1.19	....	0.74	....	0.13
Maximum	....	300	....	448	....	348	....	0,173
Minimum	....	50	....	74	....	32	....	29
Accuracy	....	B	....	B	....	B	....	B

Daily gage height, in feet, and discharge, in second-feet, of Crooked Creek at Central House for 1909–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Dis-charge.	Gage height.	Dis- e.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
1911.								
1			2.05	416	1.18	111	0.02	5.3
2			1.85	332	1.50	200	0	5.0
3			1.75	292	2.68	695	0	5.0
4			1.70	273	2.45	591	−.02	4.8
5			1.78	304	2.38	560	−.05	4.5
6			2.20	481	1.95	374	−.05	4.5
7			1.95	374	1.90	353	−.05	4.5
8			1.58	229	1.55	218	−.05	4.5
9			1.75	292	1.42	174	−.05	4.5
10			1.62	243	1.15	104	−.05	4.5
11			1.48	194	.95	68	−.05	4.5
12			1.45	184	.95	.68	−.05	4.5
13			1.70	273	.95	68	−.05	4.5
14			1.72	265	.82	51	−.05	4.5
15			1.80	281	.70	38	−.05	4.5
16			1.68	266	.68	36	.50	23
17			1.70	273	.70	38	.55	26
18			2.05	416	.70	38	.60	30
19			1.90	353	.62	32	.45	20
20			1.68	266	.62	32	.50	23
21			1.55	218	.60	30	.50	23
22			1.50	200	.60	30	.50	23
23			1.42	174	.52	24	.40	17.0
24			1.42	174	.30	12.2	.35	14.6
25			1.32	146	.24	10.0	.30	12.2
26			1.25	128	.24	10.0	.30	12.2
27			1.25	128	.18	8.1	.30	12.2
28			1.22	120	.18	8.1	.25	10.4
29	1.80	312	1.20	115	.20	8.5	.30	12.2
30	1.68	266	1.18	111	.10	6.5	.25	10.4
31	1.65	254			.08	6.2	.20	8.5
Mean discharge		277		251		129		11.2
Second-feet per square mile		1.72		1.56		0.801		0.070
Run-off (depth in inches on drainage area)		0.19		1.74		0.92		0.08
Maximum		312		481		695		30
Minimum		254		111		6.2		4.5
Accuracy		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Crooked Creek at Central House for 1909–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1			2.40	546	1.00	55	0.40	7.5	1.00	55	1.08	69
2			2.60	635	.92	44	.45	8.6	1.22	98	1.05	64
3			2.30	503	.90	41	.45	8.6	1.30	118	1.00	55
4			1.80	293	.88	39	.45	8.6	1.35	132	.95	48
5			1.45	164	.80	30	.45	8.6	1.25	106	.90	41
6			1.25	106	.75	26	.45	8.6	1.28	113	.90	41
7			1.18	89	.68	19.7	.55	12.2	1.25	106	.88	39
8			.98	52	.65	17.8	.95	48	1.18	89	.90	41
9	0.80	30	.95	48	.60	14.5	.90	41	1.10	72	.90	41
10	.75	26	.95	48	.65	17.8	.95	48	1.05	64	.85	36
11	.82	32	.80	30	.65	17.8	.98	52	1.08	69	.80	30
12	.98	52	.85	36	.60	14.5	1.50	180	1.10	72	.80	30
13	1.15	82	1.35	132	.58	13.6	1.48	173	1.10	72	.90	41
14	1.52	187	1.45	164	.55	12.2	1.28	113	1.05	64	.90	41
15	1.30	118	1.40	147	.50	9.8	1.15	82	1.05	64	1.00	55
16	1.42	154	2.50	590	.50	9.8	1.05	64	1.10	72	1.00	55
17	1.60	216	1.90	334	.50	9.8	1.00	55	1.45	164	1.00	55
18	1.58	209	1.55	198	.50	9.8	.90	41	1.80	293	1.00	55
19	1.60	216	2.05	397	.45	8.6	.88	39	1.60	216		
20	1.42	154	1.70	254	.48	9.3	.90	41	1.58	209		
21	1.30	118	1.40	147	.45	8.6	.85	36	1.62	224		
22	1.38	141	1.52	187	.45	8.6	.82	32	1.65	235		
23	1.85	214	2.80	726	.48	9.3	.80	30	1.48	173		
24	1.52	187	3.20	916	.45	8.6	.80	30	1.30	118		
25	1.42	154	3.10	868	.45	8.6	.80	30	1.25	106		
26	1.32	124	2.60	635	.50	9.8	.80	30	1.18	89		
27	1.25	106	2.05	397	.45	8.6	.95	48	1.10	72		
28	1.42	154	1.70	254	.45	8.6	.98	52	1.10	72		
29	1.80	293	1.50	180	.48	9.3	.95	48	1.09	70		
30	1.85	214	1.15	82	.45	8.6	.90	41	1.09	70		
31	1.55	198			.40	7.5	.90	41				
Mean discharge		147		305		16.6		47.0		116		46.5
Second-feet per square mile		0.913		1.89		0.103		0.292		0.720		0.289
Run-off (depth in inches on drainage area)		0.78		2.11		1.19		0.34		0.80		0.19
Maximum		293		916		55		180		293		69
Minimum		26		30		7.5		7.5		55		30
Accuracy		A		B		A		A		A		A

BONANZA CREEK ABOVE DITCH INTAKE.

This station was established July 4, 1908. Serious changes in the channel took place during the period covered by the records. The data are subject to large errors and should only be used with extreme care.

Discharge measurements of Bonanza Creek above ditch intake in 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
July 4	1.00	12.4	June 12	1.95	82
6	1.02	13.0	21	.50	26
Sept. 7	.92	12.3	Aug. 11	.20	16

Daily gage height, in feet, and discharge, in second-feet, of Bonanza Creek above ditch intake for 1908–1910.

[Drainage area, 7.9 square miles. Observer, Frank Miller.]

Day.	1908				1909							
	July.		August.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1				8			0.21	16.0	0.24	16.8	0.04	12.2
2				8			.20	15.7	.28	17.9	−.02	11.1
3				8			.48	25	.28	17.9	−.04	10.8
4	1.00	12	0.72	8			.28	17.9	.18	15.2	−.04	10.8
5		12	.71	8			.20	15.7	.28	17.9	−.05	10.6
6	1.02	13					.15	14.5	.28	17.9	−.06	10.4
7	1.65	37					.18	15.2	.20	15.7	−.08	10.1
8	1.60	35					.18	15.2	.25	17.1	−.08	10.1
9		27					.30	18.5	.28	17.9	−.09	10.0
10	1.20	19					.32	19.2	.28	17.9	−.09	10.0
11		18					.32	19.2	.19	15.5	−.10	9.8
12		16			0.95	82	.32	19.2	.27	17.7	−.10	9.8
13	.98	14			.70	40	.78	49	.24	16.8	−.10	9.8
14	.94	13			.68	38	.29	18.2	.22	16.3	−.10	9.8
15	.92	12			.60	32	.62	34	.20	15.7		
16		11			.60	32	.32	19.2	.18	15.2		
17		11				32	.24	16.8	.15	14.5		
18		10				30	.24	16.8	.13	14.0		
19		10				28	.22	16.3	.13	14.0		
20	.81	10				27	.22	16.3	.11	13.5		
21	.80	9			.50	26	.21	16.0	.10	13.3		
22	.78	9				26	.21	16.0	.10	13.3		
23		9			.50	26	.21	16.0	.08	12.9		
24	.83	10				24	.20	15.7	.05	12.4		
25		10				22	.18	15.2	.17	15.0		
26	.81	10				20	.16	14.7	.16	14.8		
27	.79	9				20	.17	15.0	.13	14.0		
28	.80	9				20	.19	15.5	.12	13.8		
29		9				20	.22	16.3	.11	13.5		
30		9			.32	19.2	.22	16.3	.10	13.3		
31		9					.22	16.3	.08	12.9		
Mean discharge		12.3		8		30		18.4		15.3		10.4
Second-feet per square mile		1.56		1.01		3.80		2.33		1.94		1.32
Run-off (depth in inches on drainage area)		180		0.19		2.68		2.69		2.24		.68
Maximum		37		8		82		49		17.9		12.2
Minimum		9		8		19.2		14.5		12.4		9.8
Accuracy		D		D		B		B		B		B

Day.	June.	July.
1910.		
1	38	19
2	32	15
3	36	10
4	30	9
5	29	32
6	23	25
7	20	14
8	20	12
9	24	13
10	42	10
11	35	9
12	30	8
13	21	8
14	16	7
15	15	5
16	19	5
17	16	5
18	12	30
19	14	18
20	19	13
1910—Continued.		
21	28	11
22	30	10
23	27	11
24	24	16
25	15	12
26	18	9
27	18	8
28	20	8
29	35	8
30	30	27
31		30
Mean discharge	24.5	13.5
Second-feet per square mile	3.10	1.71
Run-off (depth in inches on drainage area)	3.46	1.97
Accuracy	D	D

NOTE.—These discharges were obtained by indirect methods and may be considerably in error.

BONANZA CREEK BELOW DITCH INTAKE.

A gage was installed on Bonanza Creek June 5, 1911, just below the ditch intake, to take the place of the oné above the intake at which records had been kept during the three previous years. In order to obtain the natural flow of the creek at this point the discharge of Bonanza ditch at intake should be added.

Discharge measurements of Bonanza Creek below ditch intake, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 5	3.35	18.6	June 2	5.10	44
July 20	2.65	0.30	July 5	4.48	.28
			Sept. 7	4.48	[a] .50

[a] Estimated.

Daily gage height, in feet, and discharge, in second-feet, of Bonanza Creek below ditch intake for 1911–12.

[Observer, Frank Miller.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1			3.06	6.7	2.65	0.3	2.64	0.3
2			3.00	5.0	2.65	.3	2.64	.3
3			3.44	25	2.65	.3	2.64	.3
4			3.22	12.4	2.65	.3	2.64	.3
5	3.35	19.0	2.95	4.0	2.65	.3	2.64	.3
6	3.22	12.4	2.70	.7	2.65	.3	2.64	.3
7	3.12	8.5	2.70	.7	2.65	.3	2.65	.3
8	3.03	5.8	2.68	.5	2.65	.3	2.65	.3
9	3.08	7.2	2.68	.5	2.65	.3	2.65	.3
10	2.88	2.7	2.68	.5	2.65	.3	2.65	.3
11	2.74	1.1	2.68	.5	2.65	.3	2.65	.3
12	2.88	2.7	2.68	.5	2.65	.3	2.65	.3
13	2.98	4.6	2.66	.4	2.65	.3	2.65	.3
14	3.00	5.0	2.64	.3	2.65	.3		
15	3.12	8.5	2.64	.3	2.65	.3		
16	3.00	5.0	2.64	.3	2.66	.4		
17	3.16	10.0	2.64	.3	2.66	.3		
18	2.97	4.4	2.64	.3	2.66	.3		
19	2.96	4.2	2.64	.3	2.66	.4		
20	2.76	1.2	2.64	.3	2.65	.3		
21	2.90	3.0	2.64	.3	2.65	.3		
22	2.90	.7	2.64	.3	2.65	.3		
23	2.74	1.1	2.64	.3	2.65	.3		
24	2.71	.8	2.64	.3	2.65	.3		
25	2.71	.8	2.65	.3	2.65	.3		
26	2.71	.8	2.65	.3	2.65	.3		
27	2.70	.7	2.65	.3	2.65	.3		
28	2.70	.7	2.65	.3	2.65	.3		
29	2.70	.7	2.65	.3	2.65	.3		
30	2.70	.7	2.65	.3	2.65	.3		
31			2.65	.3	2.64	.3		
Mean discharge		4.32		2.03		.30		.30
Accuracy		B		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Bonanza Creek below ditch intake for 1911–12—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1	....	....	4.49	0.4	4.47	0.3	4.48	0.3
2	5.20	51	4.49	.4	4.47	.3	4.49	.4
3	5.10	44	4.48	.3	4.47	.3	4.49	.4
4	4.46	5.3	4.48	.3	4.47	.3	4.49	.4
5	4.22	.6	4.48	.3	4.47	.3	4.49	.4
6	4.21	.5	4.48	.3	4.47	.3	4.49	.4
7	4.20	.4	4.48	.3	4.48	.3	4.48	.3
8	4.20	.4	4.48	.3	4.48	.3	4.48	.3
9	4.21	.5	4.48	.3	4.48	.3	4.48	.3
10	4.20	.4	4.48	.3	4.48	.3	4.48	.3
11	4.20	.4	4.48	.3	4.64	2.4	4.48	.3
12	4.22	.6	4.48	.3	4.51	.6	4.48	.3
13	4.28	1.3	4.48	.3	4.50	.5	4.48	.3
14	4.38	2.9	4.48	.3	4.52	.7	4.48	.3
15	4.82	25	4.48	.3	4.49	.4	4.48	.3
16	5.11	45	4.48	.3	4.48	.3	4.48	.3
17	4.27	1.2	4.48	.3	4.48	.3	4.50	.5
18	4.24	.8	4.48	.3	4.48	.3	4.70	3.7
19	4.90	30	4.48	.3	4.48	.3	4.60	1.6
20	4.32	1.9	4.48	.3	4.48	.3	4.64	2.4
21	4.22	.6	4.47	.3	4.48	.3	4.90	11
22	4.72	19	4.47	.3	4.48	....	....	....
23	5.70	90	4.47	.3	4.48	.3	....	....
24	5.40	46	4.47	.3	4.48	.3	....	....
25	5.38	44	4.47	.3	4.48	.3	....	....
26	5.15	26	4.47	.3	4.48	.3	....	....
27	4.92	12	4.47	.3	4.49	.4	....	....
28	4.92	12	4.47	.3	4.48	.4	....	....
29	4.60	1.6	4.47	.3	4.49	.4	....	....
30	4.49	.4	4.47	.3	4.49	.4	....	....
31	....	....	4.47	.3	4.48	.3	....	....
Mean discharge	....	16.0	....	.31	....	.41	....	1.17
Accuracy	....	D	....	D	....	D	....	D

NOTE.—New rating used after June 22, 1912. Discharges only approximate. Seepage through and beneath the diversion dam was about 0.3 second-foot.

INDEPENDENCE CREEK AT CLAIM "NO. 9 ABOVE."

This station was established June 6, 1911. The channel was fairly permanent, but sufficient measurements were not made to give a well-defined discharge curve. It was necessary to abandon the station in 1912 because an indeterminate amount of water was being diverted above the gage for sluicing.

Discharge measurements of Independence Creek at claim No. 9 above, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 6	2.42	41	June 4	2.46	22
July 19	1.33	2.0	July 6	....	1.4
Aug. 16	1.36	3.7			

Daily gage height, in feet, and discharge, in second-feet, of Independence Creek at claim "No. 9 above" for 1911.

[Drainage area, 8.6 square miles. Observer, Jack Hendricks.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.58	54	1.21	1.6	1.42	3.6
2			3.50	164	1.21	1.6	1.46	4.1
3			2.62	58	1.21	1.6	1.38	3.1
4			3.54	170	1.17	1.3	1.33	2.6
5			2.75	71	1.17	1.3	1.33	2.6
6	2.38	39	2.29	32	1.17	1.3	1.29	2.2
7	2.50	48	1.83	11.8	1.17	1.3	1.25	1.9
8	2.46	45	1.67	7.8	1.17	1.3	1.21	1.6
9	2.33	35	1.54	5.3	1.17	1.3	1.17	1.3
10	2.21	28	1.42	3.6	1.25	1.9	1.29	2.2
11	2.08	21	1.38	3.1	1.25	1.9	1.42	3.6
12	2.42	42	1.46	4.1	1.25	1.9		
13	2.33	35	1.38	3.1	1.25	1.9		
14	2.50	48	1.38	3.1	1.29	2.2		
15	2.67	63	1.33	2.6	1.46	4.1		
16	2.83	79	1.33	2.6	1.38	3.1		
17	3.33	140	1.33	2.6	1.38	3.1		
18	3.17	119	1.33	2.6	1.33	2.6		
19	2.75	71	1.33	2.6	1.33	2.6		
20	2.42	42	1.33	2.6	1.29	2.2		
21	2.33	35	1.33	2.6	1.29	2.2		
22	2.12	23	1.29	2.2	1.29	2.2		
23	2.17	26	1.29	2.2	1.29	2.2		
24	2.21	28	1.29	2.2	1.25	1.9		
25	2.08	21	1.29	2.2	1.25	1.9		
26	1.92	14.7	1.25	1.9	1.25	1.9		
27	1.79	10.6	1.25	1.9	1.25	1.9		
28	1.62	6.7	1.25	1.9	1.33	2.6		
29	2.54	51	1.21	1.6	1.33	2.6		
30	2.25	30	1.21	1.6	1.33	2.6		
31			1.21	1.6	1.38	3.1		
Mean discharge		44.0		20.3		2.10		2.62
Second-feet per square mile		5.12		2.36		0.244		0.305
Run-off (depth in inches on drainage area)		4.43		2.72		0.28		0.12
Maximum		140		170		4.1		4.1
Minimum		6.7		1.6		1.3		1.3
Accuracy		C		B		B		B

NOTE.—Above 50 second-feet these records are only approximate.

MAMMOTH CREEK AT MILLER HOUSE.

This station was established July 2, 1908. The gage was nailed to a log retaining wall on the left bank of the stream just below the bridge opposite the Miller House. The datum of the gage remained constant. During high water the channel shifted considerably and several rating curves were used, all of which were, however, fairly well defined.

Since on or about June 19, 1909, a ditch has diverted water from the creek past the gage. As it was not possible to obtain accurate records of the amount diverted the total flow of the stream can be only approximately determined since that date.

Discharge measurements of Mammoth Creek at Miller House in 1908–1910.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909—Continued.	*Feet.*	*Sec.-ft.*
July 2	0.85	34	June 15	3.85	120
6	.70	21	20	3.60	70
7	1.00	48	Aug. 12	3.08	15.8
Sept. 6	.90	35			
7	.85	31	1910.		
			May 29	3.20	17.1
1909.			June 5	3.32	27
June 10	4.05	200	July 14	3.19	16.4
11	4.20	253	23	3.30	27

Daily gage height, in feet, and discharge, in second-feet, of Mammoth Creek at Miller House for 1908–1910.

[Drainage area, 37.1 square miles. Observer, J. F. Kelly.]

Day.	1908				1909 [a]							
	September.		October.		May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.50	14.4			2.15	358	3.40	40	3.30	30
2			.50	14.4			2.20	377	3.30	30	3.30	30
3			.50	14.4			2.40	451	3.00	12.0	3.20	22
4			.50	14.4			2.80	604	3.00	12.0	3.30	30
5			.50	14.4			2.75	584	3.00	12.0	3.30	30
6			.50	14.4			2.40	451	3.00	12.0	3.25	26
7			.50	14.4			2.20	377	3.40	40	3.30	30
8	0.90	36	.50	14.4			2.25	396	3.40	40	3.40	40
9	.80	27	.50	14.4	0.80	28	4.55	414	2.40	40	3.45	46
10	.90	36	.40	13.0	.90	37	4.00	176	3.30	30	3.50	53
11	.85	31	.40	13.0	.80	28	4.30	294	3.30	30	3.50	53
12	.70	21	.40	13.0	.90	37	4.20	252	3.35	35	3.25	26
13	.75	23	.40	13.0	.85	32	4.25	273	4.25	273	3.00	12.0
14	.70	21			.80	28	4.10	212	4.00	176	2.90	9.0
15	.75	23			1.10	62	3.90	142	3.85	128	2.90	9.0
16	.70	21			1.40	122	3.75	102	3.55	62	2.90	9.0
17	.75	23			1.65	190	4.35	318	3.35	35	2.90	9.0
18	.70	21			1.80	237	4.05	194	3.30	30	2.82	6.6
19	.90	36			1.40	122	3.60	70	3.20	22	2.80	6.0
20	.85	31			1.10	62	3.55	62	3.20	22	2.95	10.5
21	.80	27			1.05	55	3.50	53	3.10	16.0	2.90	9.0
22	.70	21			1.00	48	3.50	53	3.00	12.0	2.80	6.0
23	.60	16.7			1.25	88	3.45	46	3.00	12.0	2.80	6.0
24	.60	16.7			1.65	190	3.50	53	3.00	12.0	2.80	6.0
25	.55	15.4			1.75	221	3.45	46	3.00	12.0	2.80	6.0
26	.50	14.4			1.75	221	3.60	70	3.00	12.0	2.80	6.0
27	.50	14.4			1.55	161	3.55	62	3.00	12.0	2.80	6.0
28		14.9			1.55	161	3.55	62	3.15	19.0	2.80	6.0
29	.55	15.4			1.70	205	3.40	40	3.50	53	2.80	6.0
30	.50	14.4			2.00	305	3.40	40	3.40	40	2.80	6.0
31					2.00	305			3.30	30	2.80	6.0
Mean discharge		22.6		14.0		128						
Second-feet per square mile		0.609		0.377		3.45						
Run-off (depth in inches on drainage area)		0.52		0.18		2.95						
Maximum		36		14.4		305						
Minimum		14.4		13.0		28		221		42.4		17.0
Accuracy		B		B		C		C		B		B

[a] From June 19 to Aug. 17 about 20 second-feet was diverted above gage and should be added to the above discharges for that period in order to obtain the natural flow of the stream.

Daily gage height, in feet, and discharge, in second-feet, of Mammoth Creek at Miller House for 1908–1910—Continued.

Day.	May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.						
1	......	......	3.50	47	3.50	47
2	......	......	3.60	61	3.30	25
3	......	......	3.45	41	3.25	21
4	......	......	3.35	30	3.35	30
5	......	......	3.35	30	3.75	90
6	......	......	3.30	25	3.55	54
7	......	......	3.20	17.5	3.38	33
8	......	......	3.20	17.5	3.30	25
9	......	......	3.30	25	3.20	17.5
10	......	......	3.45	41	3.20	17.5
11	......	......	3.30	25	3.20	17.5
12	......	......	3.28	24	3.20	17.5
13	......	......	3.22	19.0	3.20	17.5
14	......	......	3.15	14.8	3.25	21
15	3.10	12.0	3.20	17.5	3.20	17.5
16	3.15	14.8	3.32	27	3.15	14.8
17	3.35	30	3.30	25	3.22	19.0
18	3.50	47	3.22	19.0	3.80	102
19	3.50	47	3.25	21	3.40	35
20	3.40	35	3.22	19.0	3.30	25
1910—Con.						
21	3.30	25	3.60	61	3.30	25
22	3.20	175	3.50	47	3.30	25
23	3.55	54	3.40	35	3.30	25
24	3.65	70	3.38	33	3.40	35
25	3.50	47	3.30	25	3.30	25
26	3.25	21	3.32	27	3.25	21
27	3.25	21	3.45	41	3.20	17.5
28	3.15	14.8	3.50	47	3.18	16.4
29	3.40	35	3.85	115	3.15	14.8
30	3.50	47	3.50	47	3.20	17.5
31	3.60	61	......	......	3.32	27
Mean discharge	......	35.2	......	34.1	......	28.9
Accuracy	......	B	......	B	......	B

NOTE.—From May 26 to July 31 the discharge of Mammoth Creek diversion ditch should be added to the above discharge to obtain the natural flow of the creek.

MAMMOTH CREEK DIVERSION DITCH.

Mammoth Creek ditch diverts water from Mammoth Creek just above the mouth of Miller Creek. When mining was being done on the creek below the Miller House this ditch was used to carry past the mine all water except what was needed for sluicing.

A gage was installed on the ditch at the intake on May 26, 1910, in order to determine the amount diverted, so that the total flow of Mammoth Creek might be computed. The records are rather incomplete and subject to considerable error because of the unstable conditions of the ditch near the gage.

Discharge measurements of Mammoth Creek diversion ditch at intake in 1910.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 29	1.81	33
June 5	1.87	34

NOTE.—Zero discharge would be at about gage height 1.20.

Daily gage height, in feet, and discharge, in second-feet, of Mammoth Creek diversion ditch at intake for 1910.

[Observer, J. F. Kelly.]

Day.	May.		June.		July.		Day.	May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1				33		0	21				30	1.50	10.7
2				34		0	22			1.80	30		0
3			1.87	36		0	23			1.75	26		0
4				36		0	24				0		0
5				36		0	25				0		0
6				37		0	26		24	1.75	26		0
7				37		0	27		23	1.75	26		0
8				37		0	28	1.75	26		0		0
9				38		0	29	1.80	30		0		0
10				38		0	30		31		0	1.80	30
11				39		0	31		32			1.50	10.7
12			1.90	39		0							
13			1.90	39		0	Mean discharge		27.7		26.2		3.0
14				34		0	Accuracy		D		D		D
15				30		0							
16			1.75	26		0							
17			1.75	26		0							
18			1.50	10.7	1.60	16.0							
19			1.50	10.7		14.0							
20			1.80	30		12.0							

MILLER CREEK AT MOUTH.

This station was established June 7, 1911. The conditions at the section were favorable for good results during 1911, but in 1912 the overflow and seepage from the Bonanza Creek ditch deposited such quantities of silt about the gage that it had to be abandoned after July 15.

Discharge measurements of Miller Creek at mouth in 1908–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
July 6		5.9	June 7	2.47	27	June 3	3.05	60
Sept. 7		11.2	July 19	1.62	2.0	4	2.78	36
			22	1.58	1.9	July 6	2.08	2.7
1909.			22	1.58	1.6	Aug. 22		2.6
June 21		19.0	Aug. 15	1.47	1.0			
Aug. 13		10.1	17	1.78	3.9			
1910.								
July 14		3						
23		6						

Daily gage height, in feet, and discharge, in second-feet, of Miller Creek at mouth for 1911-12.

[Drainage area, 10.5 square miles. Observer, M. E. Lorenz.]

Day.	1911								1912			
	June.		July.		August.		September.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	......	......	2.0	8.5	1.45	0.9	1.45	0.9	......	......	2.05	2.5
2	......	......	2.2	14.7	1.45	.9	1.45	.9	......	......	2.45	14.7
3	......	......	2.75	44	1.45	.9	1.45	.9	......	......	2.15	4.1
4	......	......	2.75	44	1.45	.9	1.45	.9	2.80	38	2.10	3.0
5	......	......	2.45	26	1.45	.9	1.45	.9	2.60	23	2.10	3.0
6	......	......	2.2	14.7	1.45	.9	1.45	.9	2.45	14.7	2.05	2.5
7	2.45	26	2.0	8.5	1.45	.9	1.45	.9	2.40	12.3	2.00	2.0
8	2.45	26	2.0	8.5	1.45	.9	......	......	2.35	10.3	2.15	4.1
9	2.45	26	1.85	5.3	1.45	.9	......	......	2.30	8.3	2.10	3.0
10	2.	14.7	1.7	3.0	1.45	.9	......	......	2.25	6.8	2.10	3.0
11	2.2	14.7	1.7	3.0	1.45	.9	......	......	2.25	6.8	2.05	2.5
12	2.2	14.7	1.85	5.3	1.45	.9	......	......	2.75	34	2.05	2.5
13	2.45	26	1.7	3.0	1.45	.9	......	......	2.55	20	2.00	2.0
14	2.2	14.7	1.7	3.0	1.45	.9	......	......	2.40	12.3	2.00	2.0
15	2.45	26	1.7	3.0	1.45	.9	......	......	3.20	76	2.00	2.0
16	2.45	26	1.7	3.0	1.7	3.0	......	......	2.80	38	......	......
17	2.45	26	1.7	3.0	1.85	5.3	......	......	2.60	23	......	......
18	2.75	44	1.7	3.0	1.85	5.3	......	......	2.60	23	......	......
19	2.45	26	1.55	1.6	1.85	5.3	......	......	2.70	30	......	......
20	2.2	14.7	1.55	1.6	1.7	3.0	......	......	2.45	14.7	......	......
21	2.4	23	1.55	1.6	1.7	3.0	......	......	2.80	38	......	......
22	2.2	14.7	1.55	1.6	1.7	3.0	......	......	3.10	65	......	......
23	2.2	14.7	1.55	1.6	1.45	.9	......	......	3.30	87	......	......
24	2.2	14.7	1.55	1.6	1.45	.9	......	......	2.95	50	......	......
25	2.2	14.7	1.55	1.6	1.45	.9	......	......	2.80	38	......	......
26	2.1	11.3	1.5	1.2	1.45	.9	......	......	2.60	23	......	......
27	2.0	8.5	1.5	1.2	1.45	.9	......	......	2.55	20	......	......
28	2.0	8.5	1.5	1.2	1.45	.9	......	......	2.50	17.1	......	......
29	2.0	8.5	1.45	.9	1.45	.9	......	......	2.40	12.3	......	......
30	2.2	14.7	1.45	.9	1.45	.9	......	......	2.20	5.2	......	......
31	......	......	1.45	.9	1.45	.9	......	......	......	......	......	......
Mean discharge	......	19.1	......	7.13	......	1.60	......	.90	......	24.9	......	3.53
Second-feet per square mile	......	1.82	......	0.679	......	0.152	......	0.086	......	2.37	......	0.336
Run-off (depth in inches on drainage area)	......	1.62	......	0.78	......	0.18	......	0.02	......	2.38	......	0.19
Maximum	......	44	......	44	......	5.3	......	0.9	......	87	......	14.7
Minimum	......	8.5	......	0.9	......	0.9	......	0.9	......	5.2	......	2.0
Accuracy	......	B	......	A	......	A	......	A	......	D	......	D

DEADWOOD CREEK ABOVE SWITCH CREEK.

This station was established June 16, 1909. The gage was located on the right bank of Deadwood Creek about 500 feet above the mouth of Switch Creek. Its datum was not changed during the period covered by the records. The channel was composed of sand and gravel, and during high water was liable to considerable change.

Sufficient measurements were made, so that the records are believed to be fairly accurate. The particular object of this station was to determine the feasibility of obtaining water for hydraulicking below Switch Creek. The lowest discharge was 1.2 second-feet on 30 days in August and September, 1911. In order to obtain a working head of 200 feet at the mouth of Switch Creek it would be necessary to have the intake to the ditch or pipe line 2 to 3 miles above the gaging station, which would reduce the drainage area about 20 per cent. The discharge would probably not decrease quite so much. The records show conclusively that without storage for a considerable period during each mining season the normal water supply would be insufficient for continuous hydraulicking even on a small scale.

Discharge measurements of Deadwood Creek above Switch Creek in 1908–1912.

Date.	Gage height.	Dis-charge.	Date.	Gage height.	Dis-charge.	Date.	Gage height.	Dis-charge.
1908.	*Feet.*	*Sec.-ft.*	1910—Contd.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
July 1		9.1	July 16	0.27	4.3	May 27	0.77	12.0
			20	.54	12.6	31	.95	19.7
1909.						July 13	1.23	2.6
June 16	0.85	31	1911.			Sept. 10	1.45	9.0
19	.80	24	May 30	1.08	48			
Aug. 10	.68	16.2	July 26	.45	1.8			
			Aug. 18	.50	3.5			
1910.								
May 30	1.01	59						
June 3	.86	36						

Daily gage height, in feet, and discharge, in second-feet, of Deadwood Creek above Switch Creek for 1909–1912.

[Drainage area, 21.3 square miles. Observer, Alfred Johnson.]

Day.	June.		July.		August.		September.	
	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
1909.								
1			0.6	12.5	0.7	17.5	0.5	8.0
2			.5	8.0	.7	17.5	.5	8.0
3			.5	8.0	.7	17.5	.5	8.0
4			.5	8.0	.6	12.5	.5	8.0
5			.4	5.0	.6	12.5	.5	8.0
6			.4	5.0	.6	12.5	.5	5.0
7			.8	25	.6	12.5	.4	5.0
8			.8	25	.7	17.5	.4	5.0
9			.7	17.5	.7	17.5	.4	5.0
10			.7	17.5	.7	17.5	.4	5.0
11			.7	17.5	.7	17.5	.4	5.0
12			.6	12.5	.7	17.5	.4	5.0
13			1.1	77	.6	12.5	.4	5.0
14			.8	25	.6	12.5	.4	5.0
15			.7	17.5	.6	12.5	.4	5.0
16	0.8	25	.7	17.5	.6	12.5	.4	5.0
17	1.2	105	.6	12.5	.6	12.5	.4	5.0
18	1.0	53	.6	12.5	.6	12.5	.4	5.0
19	.8	25	.6	12.5	.6	12.5	.4	5.0
20	.8	25	.5	8.0	.6	12.5	.4	5.0
21	.7	17.5	.5	8.0	.6	12.5	.4	5.0
22	.7	17.5	.5	8.0	.5	8.0		
23	.7	17.5	.5	8.0	.5	8.0		
24	.7	17.5	.4	5.0	.5	8.0		
25	.8	25	.4	5.0	.6	12.5		
26	.8	25	.4	5.0	.5	8.0		
27	.7	17.5	.6	12.5	.5	8.0		
28	.7	17.5	.7	17.5	.5	8.0		
29	.6	12.5	.9	36	.5	8.0		
30	.6	12.5	.9	36	.5	8.0		
31			.9	36	.5	8.0		
Mean discharge		27.5		16.8		12.5		5.71
Second-feet per square mile		1.31		0.789		0.587		0.268
Run-off (depth in inches on drainage area)		0.73		0.91		0.68		0.21
Maximum		105		77		17.5		8
Minimum		12.5		5.0		8.0		5
Accuracy		B		B		B		B

NOTE.—The discharge rating curve is fairly well defined below 40 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Deadwood Creek above Switch Creek for 1909–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.												
1			1.00	58	1.05	68	0.60	15.3	0.30	5.0		
2			1.00	58	.75	25	.50	11.0	.32	5.5		
3			.98	55	.60	15.3	.43	8.7	.30	5.0		
4			.88	39	.55	13.2	.40	7.7	.30	5.0		
5			.85	35	.65	18.2	.35	6.4	.33	5.8		
6			.78	27	.55	13.2	.35	6.4	.35	6.4		
7			.78	27	.50	11.0	.33	5.8	.30	5.0		
8			.62	16.4	.50	11.0	.33	5.8	.30	5.0		
9			.88	39	.40	7.7	.30	5.0	.30	5.0		
10			.85	35	.35	6.4		5.0	.30	5.0		
11			.90	41	.35	6.4	.30	5.0		5.2		
12			.82	31	.33	5.8	.28	4.5	.32	5.5		
13			.78	27	.30	5.0	.28	4.5	.35	6.4		
14			.70	21	.30	5.0	.27	4.3	.40	7.7		
15			.70	21	.30	5.0	.25	3.8	.75	25		
16			.70	21	.28	4.5	.25	3.8	.65	18.2		
17			.70	21	.42	8.4	.25	3.8	.65	18.2		
18			.60	15.3	.95	50	.30	5.0	.60	15.3		
19			.60	15.3	.75	25	.32	5.5	.55	13.2		
20			.65	18.2	.55	13.2	.35	6.4	.50	11.0		
21			.70	21	.55	13.2		5.7				
22			.75	25	.55	13.2	.30	5.0				
23			.70	21	.43	8.7	.28	4.5				
24			.60	15.3	.42	8.4	.25	3.8				
25			.55	13.2	.38	7.2	.32	5.5				
26			.50	11.0		6.4	.30	5.0				
27			.50	11.0	.32	5.5	.35	6.4				
28			1.20	98	.32	5.5	.30	5.0				
29			1.22	102	.45	9.4	.33	5.8				
30	1.04	66	.92	44	.78	27	.32	5.5				
31	1.10	77			.68	19.9	.30	5.0				
Mean discharge [a]				32.8		14.2		5.84		8.92		
Second-feet per square mile				1.54		0.667		0.274		0.414		
Run-off (depth in inches on drainage area)				1.72		0.77		0.32		0.31		
Maximum				102		68		15.3		25		
Minimum				11.0		4.5		3.8		5.0		
Accuracy				A		A		A		A		

[a] The discharge rating curve is well defined for all stages.

Daily gage height, in feet, and discharge, in second-feet, of Deadwood Creek above Switch Creek for 1909–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.												
1			1.10	50	0.82	23		1.6	0.42	1.6	0.42	1.6
2			1.20	61	.90	30		1.6		1.4		
3			1.15	56	1.08	48		1.6	.40	1.2		
4			1.30	72	.95	35	0.42	1.6		1.2		
5			1.28	70	.95	35		1.4	.40	1.2		
6			1.50	95	.90	30	.40	1.2		1.2		
7			1.10	50	.85	26		1.4	.40	1.2		
8			1.10	50	.75	17.2	.42	1.6		1.2		
9			1.10	50	.70	13.5	.43	1.8	.40	1.2		
10			1.05	45	.60	7.5		1.5		1.2		
11			1.00	40	.57	6.2	.40	1.2	.40	1.2		
12			1.00	40	.55	5.4		1.2		1.2		
13			1.05	45		5.4	.40	1.2	.40	1.2		
14			1.10	50	.55	5.4	.45	2.2		1.2		
15			1.20	61		4.8	.50	3.3	.40	1.2		
16			1.10	50	.52	4.1	.53	4.6		1.2		
17			.90	30	.58	6.7	.52	4.1	.40	1.2		
18			1.08	48		5.4	.50	3.3	.40	1.2		
19			1.10	50	.52	4.1		3.0		1.2		
20			.90	30		3.7	.47	2.7		1.2		
21			.85	26	.50	3.3		2.4		1.2		
22			.80	21		3.3		2.1	.40	1.2		
23			.80	21	.50	3.3	.43	1.8	.40	1.2		
24			.80	21		3.1		1.6	.40	1.2		
25			.75	17.2	.48	2.9		1.4	.40	1.2		
26			.70	13.5	.45	2.2	.40	1.2	.40	1.2		
27			.70	13.5	.47	2.7		1.4	.42	1.6		
28			.65	10.5		2.3	.42	1.6	.42	1.6		
29			.65	10.5		1.9		1.4	.42	1.6		
30	1.10	50	.70	13.5	.42	1.6	.40	1.2	.42	1.6		
31	1.32	74				1.6		1.4				
Mean discharge [a]				40.4		11.1		1.92		1.27		
Second-feet per square mile				1.90		0.521		0.090		0.060		
Run-off (depth in inches on drainage area)				2.12		0.60		0.10		0.07		
Maximum				95		48		4.6		1.6		
Minimum				10.5		1.6		1.2		1.2		
Accuracy				B		B		B		B		

[a] Discharges fairly well defined below 50 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Deadwood Creek above Switch Creek for 1909–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage. height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.												
1	......	......	1.58	46	1.42	7.7	......	3.0	1.60	16.0	1.50	11.2
2	......	......	1.85	65	1.40	6.8	......	3.0	......	15	1.50	11.2
3	......	......	1.70	54	1.37	5.9	......	3.0	......	15	1.48	10.3
4	......	......	1.50	40	1.35	5.3	1.25	3.0	......	14	1.48	10.3
5	......	......	1.40	34	1.35	5.3	......	5.0	......	13	1.48	10.3
6	......	......	......	20	1.30	3.8	......	7.0	......	13	1.45	9.0
7	......	......	1.25	5.2	1.27	3.3	1.46	9.4	......	12	1.45	9.0
8	......	......	1.25	5.2	1.27	3.3	1.49	10.8	1.50	11.2	1.45	9.0
9	......	......	1.30	6.8	1.25	3.0	1.42	7.7	......	10	1.45	9.0
10	......	......	1.30	6.8	1.25	3.0	......	12.0	1.45	9.0	1.42	7.7
11	......	......	1.07	5.8	1.25	3.0	1.62	17.0	1.45	9.0	1.42	7.7
12	......	......	1.30	6.8	1.25	3.0	1.65	18.5	1.50	11.2	1.45	9.0
13	......	......	1.50	15.6	1.25	3.0	1.55	13.6	1.48	10.3	1.45	9.0
14	......	......	1.40	10.9	1.25	3.0	1.52	12.2	1.50	11.2	......	......
15	......	......	1.40	10.9	......	3.0	1.48	10.3	1.45	9.0	......	......
16	......	......	1.80	32	......	3.0	......	9.0	......	10	......	......
17	1.10	29	1.50	15.6	......	3.0	1.42	7.7	1.60	16.0	......	......
18	.98	21	1.40	10.9	1.25	3.0	1.40	6.8	1.69	20	......	......
19	.95	19.8	1.70	26	1.25	3.0	1.37	5.9	1.70	21	......	......
20	.90	17.2	1.50	15.6	1.25	3.0	......	5.9	1.70	21	......	......
21	.82	13.8	1.40	10.9	1.25	3.0	1.37	5.9	1.70	21	......	......
22	.84	14.7	1.90	38	1.25	3.0	1.35	5.3	1.65	18.5	......	......
24	1.10	29	2.40	70	1.28	3.5	1.35	5.3	......	16	......	......
24	.88	16.4	2.10	50	1.30	3.8	......	5.3	......	14	......	......
25	.77	12.0	2.00	44	1.27	3.3	......	5.3	......	13	......	......
26	.88	16.4	1.90	38	1.80	26	1.35	5.3	......	13	......	......
27	.79	12.7	......	29	1.28	3.5	1.35	5.3	1.52	12.2	......	......
28	.90	17.2	......	20	1.25	3.0	1.38	6.2	1.50	11.2	......	......
29	1.20	37	1.50	11.2	1.25	3.0	1.40	6.8	1.50	11.2	......	......
30	1.10	29	1.50	11.2	1.25	3.0	1.42	7.7	1.50	11.2	......	......
31	.95	19.8	......	......	......	3.0	1.40	6.8	......	......	......	......
Mean discharge	......	20.3	......	25.2	......	4.37	......	7.61	......	13.6	......	9.44
Second-feet per square mile	......	0.953	......	1.18	......	0.205	......	0.357	......	0.638	......	0.443
Run-off (depth in inches on drainage area)	......	0.53	......	1.32	......	0.24	......	0.41	......	0.71	......	0.21
Maximum	......	37	......	70	......	26	......	18.5	......	21	......	11.2
Minimum	......	12.0	......	5.2	......	3.0	......	3.0	......	9.0	......	7.7
Accuracy	......	B	......	D	......	B	......	B	......	B	......	B

NOTE.—From June 1 to 27, 1912, the discharges were applied indirectly because of shifting channel, and on some days the discharge may be considerably in error.

PORTAGE CREEK 4 MILES ABOVE MEDICINE LAKE.

This station was established May 30, 1912. The gage was located on the left bank of Portage Creek just above the backwater from an automatic dam which was built during the spring of 1912. The channel appeared to be permanent and the records should be fairly accurate. The discharge rating curve was fairly well defined below 40 second-feet.

Discharge measurements of Portage Creek 4 miles above Medicine Lake in 1912.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
May 30	2.48	21
July 14	1.69	.53
Sept. 11	2.09	4.4

Daily gage height, in feet, and discharge, in second-feet, of Portage Creek 4 miles above Medicine Lake for 1912.

[Drainage area, 10.9 square miles. Observer, H. M. Green.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.42	17.3	2.00	2.8	1.60	0.32	2.00	2.8
2			2.50	22	1.83	1.2	1.58	.30	2.17	6.3
3			2.42	17.3	1.83	1.2	1.58	.30	2.12	5.1
4			2.21	7.4	1.83	1.2	1.62	.37	2.08	4.2
5			2.25	8.8	1.83	1.2	1.62	.37	2.08	4.2
6			2.17	6.3	1.79	.96	1.58	.30	2.12	5.1
7			2.08	4.2	1.75	.78	2.25	8.8	2.00	2.8
8			2.00	2.8	1.75	.78	2.42	17.3	2.00	2.8
9			2.00	2.8	1.71	.60	2.17	6.3	2.12	5.1
10			1.92	2.0	1.67	.48	2.04	3.5	2.12	5.1
11			1.83	1.2	1.63	.39	2.75	41	2.08	4.2
12			1.92	2.0	1.71	.60	2.50	22		
13			2.17	6.3	1.67	.48	2.25	8.8		
14			2.08	4.2	1.69	.53	2.25	8.8		
15			2.17	6.3	1.67	.48	2.17	6.3		
16			2.33	12.2	1.65	.44	2.08	4.2		
17			2.42	17.3	1.67	.48	2.08	4.2		
18			2.33	12.2	1.69	.53	2.00	2.8		
19			2.50	22	1.71	.60	1.96	2.4		
20			2.33	12.2	1.77	.86	1.92	2.0		
21			2.17	6.3	1.75	.78	1.92	2.0		
22			2.83	47	1.75	.78	1.92	2.0		
23			2.92	55	1.71	.60	1.92	2.0		
24			2.83	47	1.71	.60	1.92	2.0		
25			2.75	41	1.71	.60	1.87	1.6		
26			2.67	34	1.73	.68	1.83	1.2		
27			2.42	17.3	1.73	.68	1.87	1.6		
28			2.08	4.2	1.75	.78	1.89	1.7		
29			1.83	1.2	1.71	.60	1.89	1.7		
30	2.48	21	1.75	.78	1.67	.48	1.87	1.6		
31	2.33	12.2			1.63	.39	1.87	1.6		
Mean discharge				14.7		.76		5.14		4.34
Second-feet per square mile				1.35		0.070		0.472		0.398
Run-off (depth in inches on drainage area)				1.51		0.08		0.54		0.16
Maximum				55		2.8		41		6.3
Minimum				0.78		0.39		0.30		2.8
Accuracy				B		B		B		B

PORCUPINE DITCH AT INTAKE.

This station was established June 4, 1912. The gage was attached to the intake flume near the lower end. Measurements of discharge were made in the ditch about 50 feet below the gage. There are no indications of a change in the relation between gage height and discharge, and the records should be fairly accurate. The discharge rating curve is well defined for all stages.

Discharge measurements of Porcupine ditch at intake in 1912.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
July 5	1.12	3.2
Aug. 19	1.29	5.9
Sept. 7	1.57	12.2

Daily gage height, in feet, and discharge, in second-feet, of Porcupine ditch at intake for 1912.

[Observer, Frank Miller.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.38	7.8	1.00	1.9	1.48	10.0
2			1.30	6.1	.98	1.8	1.58	12.5
3			1.23	4.8	.95	1.6	1.50	10.5
4	1.53	11.2	1.18	4.0	.95	1.6	1.55	11.8
5	1.56	12.0	1.15	3.6	.94	1.6	1.60	13.0
6	1.60	13.0	1.08	2.7	.93	1.5	1.60	13.0
7	1.50	10.5	1.04	2.3	1.28	5.7	1.60	13.0
8	1.50	10.5	1.01	2.0	1.65	14.4	1.60	13.0
9	1.50	10.5	1.00	1.9	1.50	10.5	1.60	13.0
10	1.38	7.8	.97	1.7	1.32	6.5	1.60	13 0
11	1.32	6.5	.97	1.7	1.40	8.2	1.60	13.0
12	1.48	10.0	.95	1.6	1.60	13.0	1.60	13.0
13	1.60	13.0	.95	1.6	1.65	14.4	1.56	12.0
14	1.60	13.0	.96	1.7	1.70	15.8	1.60	13.0
15	1.45	9.4	.94	1.6	1.64	14.1	1.62	13.6
16		0	.95	1.6	1.52	11.0	1.60	13.0
17	1.35	7.2	.95	1.6	1.42	8.7	1.50	10.5
18	1.70	15.8	.95	1.6	1.34	6.9	1.55	11.8
19	1.52	11.0	.95	1.6	1.30	6.1	1.60	13.0
20	1.65	14.4	.95	1.6	1.22	4.7	1.60	13.0
21	1.80	18.8	.97	1.7	1.20	4.3	1.60	13.0
22	1.75	17.3	.97	1.7	1.17	3.9		
23		0	.97	1.7	1.14	2.3		
24		0	.97	1.7	1.15	3.6		
25		0	.97	1.7	1.18	4.0		
26		0	1.06	2.5	1.20	4.3		
27	1.80	18.8	1.10	2.9	1.40	8.2		
28	1.80	18.8	1.10	2.9	1.50	10.5		
29	1.71	16.1	1.06	2.5	1.50	10.5		
30	1.48	10.0	1.02	2.1	1.48	10.0		
31			1.02	2.1	1.45	9.4		
Mean discharge		10.2		2.47		7.13		12.5
Accuracy		A		A		A		A

BONANZA DITCH AT INTAKE.

A gage was placed at the head of the intake flume of Bonanza ditch by employees of the Mammoth Creek Mining Co., and gage-height records were kept during 1910–1912. Owing to shifting channel and temporary obstructions below the gage, the relation between gage height and discharge was subject to considerable change and the records are only fair.

Discharge measurements of Bonanza ditch at intake in 1909–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1909.	*Feet.*	*Sec.-ft.*	1910—Contd.	*Feet.*	*Sec.-ft.*	1911—Contd.	*Feet.*	*Sec.-ft.*
Aug. 11		16.0	July 15	0.68	5.3	Aug. 16	0.52	3.4
12		15.6	22	.90	10.1			
						1912.		
1910.			1911.			June 2	1.09	25
May 28	1.00	13.7	June 5	1.33	36	July 5	.45	3.2
29	1.01	15.2	5	.90	18.7	Aug. 19	.68	5.9
June 6	1.16	19.5	5	1.01	21.5	Sept. 7	.87	10.2
6	.82	9.6	July 20	.53	3.2			

Daily gage height, in feet, and discharge, in second-feet, of Bonanza ditch at intake for 1910–1912.

[Observer, Frank Miller.]

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			1.14	18.9	1.18	19.0	1.14	17.6
2			1.15	19.2	.99	13.0	1.00	13.1
3			1.20	21	.87	9.6	.90	10.2
4			1.24	23	.82	8.4	.83	8.4
5			1.26	23	1.44	28	.76	6.9
6			1.18	20	1.20	20		
7			1.10	17.3	1.00	13.3		
8			1.06	16.0	.94	11.5		
9			1.18	20	.97	12.4		
10			1.24	22	.86	9.4		
11			1.27	23	.82	8.4		
12			1.28	23	.80	7.7		
13			1.20	20	.80	7.7		
14			1.06	16.0	.74	6.6		
15			1.00	14.2		0		
16			1.14	18.6		0		
17			1.04	15.4		0		
18			.93	12.1	1.39	27		
19			1.00	13.8	1.14	17.6		
20			1.16	18.9	.97	12.2		
21			1.16	18.9	.91	10.5		
22				0	.90	10.2		
23				0	.91	10.5		
24			1.30	24	1.08	15.7		
25			1.02	14.4	.96	11.9		
26			1.06	15.7	.84	8.7		
27			1.10	17.3	.81	8.0		
28	1.01	14.7	1.11	16.9		0		
29	1.00	14.4	1.37	26		0		
30	.96	13.2	1.44	28	1.38	26		
31	1.02	15.0			1.41	27		
Mean discharge		14.3		17.9		11.6		11.2
Maximum		15.0		28		28		17.6
Minimum		13.2		0		0		6.9
Accuracy		A		C		C		B

NOTE.—Discharges from June 7 to July 14, 1910, applied by indirect methods because of shifting channel.

Daily gage height, in feet, and discharge, in second-feet, of Bonanza ditch at intake for 1910–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1			1.12	27	0.40	1.7	0.40	1.7
2			1.17	30	.40	1.7	.41	1.8
3			1.01	22	.40	1.7	.43	2.0
4			1.14	28	.40	1.7	.44	2.1
5	1.01	22	1.30	37	.36	1.4	.44	2.1
6	1.07	24	1.24	33	.35	1.4	.44	2.1
7	1.11	26	1.20	31	.34	1.3	.44	2.1
8	1.06	24	1.04	23	.34	1.3	.43	2.0
9	1.12	27	.83	13.2	.33	1.2	.43	2.0
10	1.08	25	.74	9.5	.33	1.2	.43	2.0
11	.96	19.1	.71	8.4	.33	1.2	.51	3.0
12	1.00	21	.70	8.0	.32	1.1	.51	3.0
13	1.16	29	.64	6.1	.32	1.1	.52	3.2
14	1.14	28	.62	5.5	.40	1.7		
15	1.18	30	.60	4.9	.42	1.9		
16	1.20	31	.59	4.7	.50	2.8		
17	1.19	30	.58	4.5	.54	3.6		
18	1.22	32	.56	4.1	.55	3.8		
19	1.22	32	.54	3.6	.50	2.8		
20	1.16	29	.52	3.2	.49	2.7		
21	1.16	29	.51	3.0	.45	2.2		
22	1.12	27	.50	2.8	.44	2.1		
23	1.12	27	.50	2.8	.44	2.1		
24	1.14	28	.49	2.7	.43	2.0		
25	1.02	22	.48	2.6	.42	1.9		
26	.96	19.1		2.5	.41	1.8		
27	.99	21		2.4	.41	1.8		
28	.86	14.5		2.2	.41	1.8		
29	.90	16.3	.43	2.0	.41	1.8		
30	1.00	21	.42	1.9	.41	1.8		
31			.41	1.8	.41	1.8		
Mean discharge		25.2		10.8		1.88		2.24
Maximum		32		37		3.8		3.2
Minimum		14.5		1.8		1.1		1.7
Accuracy		C		C		B		B
1912.								
1			.59	4.6	.44	3.2	.86	10.0
2	.97	20	.54	4.0	.44	3.2	.88	10.5
3	.96	19.1	.51	3.7	.43	3.1	.96	13.3
4	1.12	27	.50	3.6	.45	3.2	1.00	14.7
5	.93	17.6	.46	3.3	.44	3.2	.98	14.0
6	.74	9.5	.44	3.2	.46	3.3	.92	11.8
7	.64	6.1	.44	3.2	.64	5.3	.86	10.0
8	.58	4.5	.42	3.0	.63	5.2	.83	9.1
9	.70	8.0	.41	3.0	.60	4.7	.82	8.9
10	.56	4.1	.41	3.0	.60	4.7	.83	9.1
11	.53	3.4	.42	3.0	1.04	16.4	.80	8.3
12	.80	11.8	.41	3.0	1.30	30	.81	8.6
13	1.00	21	.40	2.9	1.15	22	.80	8.3
14	.98	20	.42	3.0	.94	12.5	.76	7.5
15	.90	16.2	.40	2.9	.84	9.4	.78	7.9
16	1.11	26	.38	2.8	.79	8.1	.89	10.8
17	1.24	33	.40	2.9	.74	7.1	1.12	20
18	1.06	17.3	.40	2.9	.71	6.5	1.14	21
19	1.02	15.6	.40	2.0	.69	6.1	1.12	20
20	1.06	17.3	.40	2.9	.66	5.7	1.22	25
21	1.01	15.1	.41	3.0	.63	5.2	.77	7.7
22	1.09	18.6	.41	3.0	.61	4.9		
23	.92	11.8	.42	3.0	.66	5.7		
24	.80	8.3	.43	3.0	.71	6.5		
25	.80	8.3	.43	3.1	.70	6.3		
26	.84	9.4	.46	3.3	.75	7.3		
27	.74	7.1	.44	3.2	.88	10.5		
28	.56	4.3	.46	3.3	.91	11.5		
29	.70	6.3	.45	3.2	.83	9.1		
30	.64	5.3	.44	3.2	.79	8.1		
31			.45	3.2	.74	7.1		
Mean discharge		13.5		3.17		7.91		12.2
Accuracy		C		B		B		B

NOTE.—New rating curve used after June 17, 1912, because of shifting channel.

BONANZA DITCH BELOW JUNCTION WITH PORCUPINE BRANCH.

This station was established June 2, 1912. The gage is driven into the bottom of the ditch just below the point where the water from the Porcupine ditch enters. The discharge curve is fairly well defined for all stages.

Discharge measurements of Bonanza ditch below junction with Porcupine Branch, 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1911.	*Feet.*	*Sec.-ft.*	1912—Continued.	*Feet.*	*Sec.-ft.*
July 20		3.3	July 5	2.41	6.7
Aug. 16		3.6	Aug. 19	2.66	11.5
1912.			Sept. 7	2.94	21
June 2	3.12	27			

Daily gage height, in feet, and discharge, in second-feet, of Bonanza ditch below junction with Porcupine Branch for 1912.

[Observer, Frank Miller.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.68	12.0	2.24	4.8	2.81	15.7
2	3.01	23	2.60	10.1	2.22	4.7	2.91	19.2
3	3.10	27	2.54	9.0	2.22	4.7	2.98	22
4	3.14	29	2.49	8.0	2.24	4.8	3.02	24
5	3.18	31	2.42	6.8	2.22	4.7	3.00	23
6	3.06	25	2.37	6.1	2.24	4.8	2.99	22
7	2.91	19.2	2.33	5.7	2.54	9.0	2.93	20
8	2.80	15.4	2.30	5.3	2.42	6.8	2.92	19.6
9	2.98	22	2.27	5.1	2.72	13.1	2.92	19.6
10	2.73	13.4	2.24	4.8	2.62	10.6	2.92	19.6
11	2.64	11.1	2.26	5.0	3.04	24	2.74	13.7
12	3.00	23	3.24	4.8	3.16	30	2.90	18.8
13	3.25	35	2.22	4.7	3.15	30	2.89	18.5
14	3.24	34	2.22	4.7	2.97	22	2.84	16.8
15	3.15	30	2.22	4.7	2.76	14.2	2.88	18.1
16	3.10	27	2.21	4.6	2.76	14.2	2.90	18.8
17	3.28	36	2.22	4.7	2.76	14.2	3.12	28
18	3.29	37	2.21	4.6	2.70	12.5	3.14	29
19	3.25	35	2.22	4.7	2.66	11.5	3.14	29
20	3.30	37	2.21	4.6	2.61	10.3	3.23	34
21	3.28	36	2.20	4.5	2.58	9.7	2.91	19.2
22	3.34	40	2.20	4.5	2.36	6.0		
23	2.99	22	2.20	4.5	2.56	9.3		
24	2.70	12.5	2.20	4.5	2.60	10.1		
25	2.67	11.8	2.21	4.6	2.60	10.1		
26	2.70	12.5	2.28	5.1	2.66	11.5		
27	2.80	15.4	2.30	5.3	2.84	16.8		
28	2.90	18.8	2.32	5.5	2.93	20		
29	2.93	20	2.30	5.3	2.88	18.1		
30	2.78	14.8	2.28	5.1	2.81	15.7		
31			2.27	5.1	2.62	10.6		
Mean discharge		24.6		5.61		12.5		21.4
Accuracy		B		B		B		B

NOTE.—Water from the Porcupine Branch was turned off part of the day on Aug. 8, 12, 15, and Sept. 11, and all day on Aug. 22.

BONANZA DITCH NEAR OUTLET.

On June 12, 1909, a gage was installed on Bonanza ditch just above the flume leading to the first pipe line. Daily records were not obtained during 1909 and 1910. Construction changes below the gage affected the control and thereby the relation between gage height and discharge. On June 6, 1911, the gage was moved upstream about 100 feet in order to get above a small riffle that would act as control and prevent the gage heights from being affected by the opening and closing of the gate, which regulated the amount of water admitted to the pipe line.

Different curves were used in 1911 and 1912. Both are well defined for all stages.

The records at this station show the total amount of water available for delivery under pressure from this system of ditches for hydraulicking on Mammoth Creek.

Discharge measurements of Bonanza ditch near outlet in 1909–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1909.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*	1912—Contd.	*Feet.*	*Sec.-ft.*
June 12	0.80	4.6	June 6	1.52	37	July 7	0.10	4.4
14	.69	3.1	7	1.39	32	16	—.12	1.8
Aug. 12	1.30	12.9	July 20	.20	3.7	Aug. 19	*a*.49	9.4
						21	.27	8.0
1910.			1912.			22	.03	3.6
May 29	1.46	19.4	June 2	1.32	37	Sept. 7	.72	19.6
June 6	1.70	27	3	1.36	40	8	.73	18.9
July 22	.80	10.1	July 5	.18	5.7			

a Backwater from waste gate below gage.

Daily gage height, in feet, and discharge, in second-feet, of Bonanza Creek ditch near outlet for 1911–12.

[Observers: Dan Nickelson, 1911; Thomas Fitzgerald, 1912.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1			1.22	28		0	0.15	3.0
2			1.60	39		0	.15	3.0
3			1.40	33		0	.15	3.0
4			1.50	36		0	.15	3.0
5			1.48	35		0	.15	3.0
6	1.52	36	1.42	33		0	.15	3.0
7	1.39	33	1.45	34		0	.15	3.0
8	1.42	33	.95	20		0	.15	3.0
9	1.38	32	.82	16.5		0	.15	3.0
10	1.40	33	.60	11.2		0	.15	3.0
11	1.25	28	.60	11.2		0		
12	1.20	27	.38	6.6		0		
13	1.45	34	.35	6.1		0		
14	1.45	34	.22	4.0		0		
15	1.55	37	.20	3.7		0		
16	1.48	35	.45	8.0		0		
17	1.52	36	.20	3.7		0		
18	1.55	37	.38	6.6		0		
19	1.52	36	.28	4.9		0		
20	1.45	34		0		0		
21	1.45	34		0	0.22	4.0		
22	1.40	33		0	.15	3.0		
23	1.22	28		0	.15	3.0		
24	1.25	28		0	.15	3.0		
25	1.10	24		0	.15	3.0		
26	.90	18.6		0	.10	2.3		
27	.90	18.6		0	.10	2.3		
28	.72	14.0		0	.15	3.0		
29	.70	13.5		0	.15	3.0		
30	1.30	30		0	.15	3.0		
31				0	.15	3.0		
Mean discharge		29.9		11.0		1.05		3.00
Maximum		37		39		4.0		3.0
Minimum		13.5		0		0		3.0
Accuracy		A		A		A		A
1912.								
1			.54	14.1	.07	4.1	.50	13.0
2	1.36	39	.46	12.0	.06	3.9	.69	18.2
3	1.39	40	.35	9.4	.05	3.8	.76	20
4	1.32	38	.26	7.4	.05	3.8	.78	21
5	1.25	36	.21	6.4	.03	3.5	.78	21
6	1.05	29	.15	5.4	.02	3.4	.74	19.7
7	.88	24	.09	4.4	.05	3.8	.72	19.1
8	.71	18.8	.02	3.4	.22	6.6	.70	18.5
9	.88	24	.00	3.1	.40	10.5	.70	18.5
10	.63	16.5	.08	4.2	.34	9.1	.71	18.8
11	.49	12.8	.02	3.4	.58	15.2	.69	18.2
12	.76	20	.00	3.1	.92	25	.70	18.5
13	1.00	28	.00	3.1	.50	13.0	.69	18.2
14	1.10	31	.00	3.1	.40	10.5	.63	16.5
15	1.30	37	.00	3.1	.35	9.4	.65	17.1
16	1.34	39	−.12	1.8	.68	17.9	.76	20
17	1.32	38	−.12	1.8	.68	17.9	.99	27
18	1.32	38	−.12	1.8	.62	16.3	1.10	31
19	1.40	40	−.13	1.7	.50	13.0	1.14	32
20	1.38	40	−.14	1.7	.62	16.3	1.18	33
21	1.22	34	−.14	1.7	.27	7.6	1.12	31
22	1.20	34	−.16	1.5	.03	3.5		
23	1.10	31	−.16	1.5	.21	6.4		
24	.80	22	−.18	1.4	.28	7.8		
25	.78	21	−.18	1.4	.28	7.8		
26	.81	22	−.15	1.6	.36	9.6		
27	.76	20	−.05	2.6	.51	13.3		
28	.85	23	−.02	2.9	.71	18.8		
29	.92	25	.00	3.1	.69	18.2		
30	.68	17.9	.05	3.8	.46	12.0		
31			.08	4.2	.40	10.5		
Mean discharge		28.9		3.87		10.4		21.4
Accuracy		A		A		A		A

NOTE.—Water turned out of ditch from July 20 to Aug. 20, 1911.

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in Crooked Creek drainage basin:

Miscellaneous measurements in Crooked Creek drainage basin from 1908 to 1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
June 4, 1912	Independence Creek.	Mammoth Creek..	"Claim No. 9 above".	22	8.6	2.56
July 6, 1912	.....do	.....do	.....do	1.4	8.6	.16
July 5, 1908	.....do	.....do	Mouth	4.6	13.2	.35
Sept. 7, 1908	.....do	.....do	.....do	11.9	13.2	.90
June 14, 1909	.....do	.....do	.....do	41	13.2	3.11
June 21, 1909	.....do	.....do	.....do	21	13.2	1.59
Aug. 13, 1909	.....do	.....do	.....do	14.2	13.2	1.08
July 14, 1910	.....do	.....do	.....do	4.6	13.2	.35
July 23, 1910	.....do	.....do	.....do	6.8	13.2	.52
July 19, 1911	Mammoth Creek	Crooked Creek	Above Miller Creek	12.4	27	.46
July 22, 1911	.....do	.....do	.....do	7.1	27	.26
Aug. 15, 1911	.....do	.....do	.....do	3.1	27	.11
July 7, 1908	Mastodon Creek	.....do	"Claim No. 21 above"	9.1	6.9	1.32
Sept. 6, 1908	.....do	.....do	.....do	3.9	6.9	.57
July 5, 1908	.....do	.....do	Mouth	7.7	10.3	.75
Sept. 7, 1908	.....do	.....do	.....do	11.5	10.3	1.12
June 14, 1909	.....do	.....do	.....do	32	10.3	3.11
June 21, 1909	.....do	.....do	.....do	23	10.3	2.23
Aug. 13, 1909	.....do	.....do	.....do	11.1	10.3	1.08
May 29, 1910	Miller Creek	.....do	Claim "No. 6 above".	11.1	7.2	1.54
June 5, 1910	.....do	.....do	.....do	17.4	7.2	2.42
July 14, 1910	.....do	.....do	.....do	3	7.2	.42
July 1, 1908	Boulder Creek	.....do	Road crossing	8	38.8	.21
July 21, 1908	.....do	.....do	.....do	5.8	38.8	.15
June 15, 1909	.....do	.....do	.....do	44	38.8	1.13
June 20, 1909	.....do	.....do	.....do	33	38.8	.85
Aug. 10, 1909	.....do	.....do	.....do	22	38.8	.57
July 21, 1910	.....do	.....do	.....do	25	38.8	.64
July 23, 1911	.....do	.....do	.....do	1.9	38.8	.049
July 7, 1912	.....do	.....do	.....do	3.1	38.8	.080
July 15, 1912	.....do	.....do	.....do	1.5	38.8	.039
Sept. 9, 1912	.....do	.....do	.....do	12.2	38.8	.31
July 1, 1908	Switch Creek	Deadwood Creek..	Mouth	.72	5.8	.12
June 16, 1909	.....do	.....do	.....do	2.3	5.8	.40
Aug. 10, 1909	.....do	.....do	.....do	1.7	5.8	.29
July 1, 1908	Albert Creek	.....do	Road crossing	9.1		
Do	Quartz Creek	.....do	.....do	2.7	8.4	.32
June 18, 1909	.....do	.....do	.....do	28	8.4	3.33
May 31, 1912	Circle Hot Springs..			.59		

BEAVER CREEK DRAINAGE BASIN.

DESCRIPTION.

Beaver Creek drains an area of 5,360 square miles lying north of Chatanika River, between Preacher Creek on the east and Tolovana River and Hess Creek on the west. It joins the Yukon from the south about 40 miles below Birch Creek and nearly opposite Hosiana River. It is formed by the junction of Big Champion and Little Champion creeks, whose headwaters interlock with those of Preacher Creek. It flows westward for about 25 miles, when it makes a right-angle turn around the southern extremity of the White Mountains and gradually assumes a northeasterly course, which it follows until it leaves the foothills and enters the flats of the Yukon, where it makes an abrupt turn to the northwest and meanders in a tortuous course to its mouth.

The average fall between Nome Creek and Fossil Creek is about 12 feet to the mile. The principal tributaries, named in order downstream, are Roy, Bryan, Brigham, Fossil, Willow, and Mascot creeks from the right, and Nome, Trail, Wickersham, and Victoria creeks from the left. Ophir Creek, the largest branch of Nome Creek, enters it from the south about a mile above Beaver Creek.

There is but little timber on the valley slopes of the headwater tributaries. Along the banks of the larger streams some spruce suitable for sluice boxes can be found.

Nome Creek was the only stream in this basin on which it was practical to attempt to get daily records of stream flow. It heads in a range of rather rugged barren mountains and probably receives a relatively high precipitation.

NOME CREEK 4 MILES ABOVE MOOSE CREEK.

A gage was installed June 25, 1912, on Nome Creek at Association claim "No. 18 above." Daily discharges have been estimated from June 25 to September 20. The least discharge recorded during that time was 14 second-feet, which is a much higher minimum flow than should be expected during a normal year. By comparing these records with those of Nome Creek above Ophir Creek for 1911 and 1912 it can be readily seen that in planning any development it would not be too conservative to expect as small a flow as 7 second-feet during a considerable part of the mining season. The rating curve for this station is well defined for all stages. The measuring conditions were good and the records should be excellent.

Discharge measurements of Nome Creek 4 miles above Moose Creek in 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 25	3.30	142	July 26	2.67	49
26	3.10	104	Aug. 15	2.35	21
July 25	2.33	19.2			

Daily gage height, in feet, and discharge, in second-feet, of Nome Creek 4 miles above Moose Creek for 1912.

[Observer, John Lindquist.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	....	....	2.40	24	....	30	2.30	18.0
2	....	....	2.30	18.0	....	27	2.30	18.0
3	....	....	2.30	18.0	....	25	2.40	24
4	....	....	2.30	18.0	....	24	2.40	24
5	....	....	2.30	18.0	....	24	2.40	24
6	....	....	2.20	14.0	....	24	2.40	24
7	....	....	2.20	14.0	....	24	2.40	24
8	....	....	2.20	14.0	....	24	2.35	21
9	....	....	2.20	14.0	2.40	24	2.35	21
10	....	....	2.20	14.0	2.40	24	2.35	21
11	....	....	2.20	14.0	2.60	42	2.30	18.0
12	....	....	2.35	21	....	33	2.30	18.0
13	....	....	2.20	14.0	2.40	24	2.30	18.0
14	....	....	2.70	53	2.40	24	....	18.0
15	....	....	2.75	59	2.35	21	....	24
16	....	....	2.60	42	2.35	21	....	30
17	....	....	2.50	32	2.30	18.0	....	40
18	....	....	2.50	32	2.30	18.0	....	50
19	....	....	2.35	21	2.30	18.0	2.40	24
20	....	....	2.35	21	2.25	16.0	2.40	24
21	....	....	....	30	2.25	16.0	....	....
22	....	....	....	35	2.30	18.0	....	....
23	....	....	....	35	2.30	18.0	....	....
24	....	....	....	25	2.30	18.0	....	....
25	3.30	138	2.33	19.8	2.30	18.0	....	....
26	3.10	107	2.65	48	2.40	24	....	....
27	2.80	65	3.20	122	2.50	32	....	....
28	....	51	3.30	138	2.55	37	....	....
29	....	37	....	100	2.45	28	....	....
30	2.40	24	....	50	2.40	24	....	....
31	....	....	....	40	2.35	21	....	....
Mean discharge	....	70.4	....	36.1	....	23.8	....	24.2
Maximum	....	138	....	1138	....	42	....	50
Minimum	....	24	....	4.0	....	16.0	....	18.0
Accuracy	....	A	....	A	....	A	....	A

NOTE.—Drainage area estimated to be about 20 square miles. Discharges on days of missing gage heights estimated by comparison with discharges of Nome Creek above Ophir Creek.

NOME CREEK ABOVE OPHIR CREEK.

This station was established July 13, 1911. The gage was located on the right bank, about 1 mile above Ophir Creek. Gage readings were taken morning and night. The channel was fairly permanent. The discharge curve for 1911 is fairly well defined below 60 second-feet; for 1912 it is well defined at all stages.

Discharge measurements of Nome Creek above Ophir Creek in 1908 and 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
Aug. 12		26	June 24	[a] 4.43	609
			July 26	2.65	98
1911.			27	2.74	119
July 13	2.97	44	Aug. 14	2.42	62
Aug. 10	2.71	19.4	15	2.38	55
10	2.78	24			
11	2.96	48			

[a] Datum of 1912 gage was 0.48 foot higher than that of the 1911 gage.

Daily gage height, in feet, and discharge, in second-feet, of Nome Creek above Ophir Creek for 1911–12.

[Drainage area, 76 square miles. Observer, Louis Schmidt.]

Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.
1911.						
1			2.68	17.9	2.91	38
2			2.66	17.0	3.12	71
3			2.65	16.5	3.20	85
4			2.62	15.1	3.10	67
5			2.62	15.1		
6			2.60	14.2		
7				14		
8				14		
9				15		
10			2.70	18.8		
11			2.98	48		
12			2.95	44		
13	2.95	44	2.84	30		
14	2.91	38	2.85	32	2.90	37
15	2.86	33	4.68	480	2.89	36
16	2.88	35	4.55	440	2.88	35
17	2.95	44	4.20	336		
18	2.92	40	3.98	275		
19	2.82	28	3.62	180		
20	2.78	25	3.36	118		
1911—Con.						
21	2.76	23	3.18	81		
22	2.88	35	3.06	61		
23	2.81	27	3.01	53		
24	2.84	30	2.96	45		
25	2.79	25	2.91	38		
26	2.76	23	2.89	36		
27	2.79	25	2.89	36		
28	2.90	37	2.91	38		
29	2.80	26	2.88	35		
30	2.74	22	2.91	38		
31	2.70	18.8	2.90	37		
Mean discharge		30.4		85.1		
Second-feet per square mile		0.400		1.12		
Run-off (depth in inches on drainage area)		0.28		1.29		
Maximum		44		480		
Minimum		18.8		14		
Accuracy		A		C		

Daily gage height, in feet, and discharge, in second-feet, of Nome Creek above Ophir Creek for 1911-12—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1			2.62	94	2.39	57		56
2			2.56	83	2.34	51	2.38	56
3			2.52	76	2.30	46	2.45	66
4			2.46	67	2.32	48	2.52	76
5			2.42	61	2.29	45	2.59	88
6			2.36	53	2.28	44	2.54	80
7			2.31	47	2.35	52	2.49	72
8			2.29	45	2.50	73	2.41	60
9			2.25	41		64	2.38	56
10			2.24	40	2.38	56		52
11			2.24	40	2.42	61	2.32	48
12			2.26	42	2.64	98	2.30	46
13			2.28	44	2.52	76	2.28	44
14			2.50	73	2.41	60	2.26	42
15			2.46	67	2.36	53	2.36	53
16			2.34	51	2.31	47	2.45	66
17			2.32	48	2.34	51	2.68	106
18			2.42	61	2.28	44	2.92	162
19			2.34	51	2.25	41	2.80	133
20			2.44	64	2.25	41	3.00	183
21	3.45	306	2.58	87	2.22	38	2.98	178
22	3.40	291	2.56	83	2.21	37	2.80	133
23	4.9	764	2.50	73	2.21	37	2.61	92
24	4.7	696	2.39	57	2.24	40	2.50	73
25	4.3	566	2.34	51	2.32	48		
26	3.9	440	2.50	73	2.44	64		
27	3.50	320	2.90	157	2.58	87		
28	3.15	222	3.00	183	2.52	76		
29	2.88	152	2.84	143	2.42	61		
30	2.76	124	2.62	94	2.39	57		
31			2.48	70		56		
Mean discharge		388		71.6		55.1		84.2
Second-feet per square mile		5.11		0.942		0.724		1.11
Run-off (depth in inches on drainage area)		1.90		1.09		0.83		0.99
Maximum		764		183		98		183
Minimum		124		40		37		42
Accuracy		B		A		A		A

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in Beaver Creek drainage basin:

Miscellaneous measurements in Beaver Creek drainage basin from 1907 to 1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 30, 1907	Beaver Creek	Yukon River	Above Champion Creek	267	122	2.19
Aug. 11, 1908	do	do	do	80	122	.66
July 11, 1911	do	do	do	137	122	1.12
Aug. 12, 1908	do	do	Above Nome Creek	108	226	.48
July 10, 1911	do	do	Above Bear Creek	328	357	.92
Aug. 30, 1907	Champion Creek	Beaver Creek	Mouth	124	67	1.85
Aug. 11, 1908	do	do	do	44	67	.66
July 11, 1911	do	do	do	58	67	.87
July 14, 1911	Nome Creek	do	Below Moose Creek	19.2	25	.77
Aug. 30, 1907	do	do	Mouth	135	120	1.12
Aug. 12, 1908	do	do	do	34	120	.28
June 9, 1911	Ophir Creek	Nome Creek	Discovery claim	5.5	22.1	.25
June 10, 1911	do	do	do	4.6	22.1	.21
June 11, 1911	do	do	do	13.8	22.1	.62
June 12, 1911	do	do	do	57	22.1	2.58
Do	do	do	do	47	22.1	2.13
June 13, 1911	do	do	do	28	22.1	1.27
Aug. 9, 1911	do	do	do	.81	22.1	.037
June 22, 1912	do	do	do	28	22.1	1.27
Do	do	do	do	62	22.1	2.81
June 23, 1912	do	do	do	165	22.1	7.47
July 27, 1912	do	do	do	22	22.1	1.00
Aug. 13, 1912	do	do	do	6.7	22.1	.30
Aug. 12, 1908	do	do	do	2.0	33	.066
July 11, 1911	Bear Creek	Beaver Creek	5 miles above mouth	3.8	5.8	.66
July 10, 1911	do	do	2 miles above mouth	6.6	16.5	.40
Aug. 29, 1907	Bryan Creek	do	4 miles above mouth	75	48	1.56
July 10, 1911	do	do	2 miles above mouth	64	60.6	1.06
Aug. 27, 1907	Trail Creek	do	5 miles above mouth	40	27	1.48
July 10, 1911	do	do	2 miles above mouth	7.9	37	.21
Aug. 27, 1907	Brigham Creek	do	Near mouth	16.0	15	1.06
Aug. 28, 1907	Fossil Creek	do	do	19.2		

HESS CREEK DRAINAGE BASIN.

DESCRIPTION.

Hess Creek rises in low mountains ranging in elevation from 2,000 to 3,000 feet opposite the headwaters of Tolovana River and Victoria Creek (a western tributary of Beaver Creek). It flows west for about 70 miles, draining an area of 1,220 square miles, and enters the Yukon about 25 miles above Rampart. About 10 miles from the Yukon it receives Troublesome Creek, its largest southern tributary.

Troublesome Creek rises southeast of Wolverine Mountain, between the headwaters of Hutlinana Creek and West Fork of Tolovana River, and flows northeastward for about 40 miles to Hess Creek.

Troublesome Creek was not studied below the mouth of Quail Creek, but it is said to follow a winding course, meandering from one side of the valley to the other through soft mucky soil abounding with "niggerheads" and covered by a thick growth of small trees which make travel slow and tedious. It also has steep high banks which make it very difficult of approach. The main and tributary valleys at its head are almost canyon-like, being shut in by high and precipitous rocky barren ridges.

Troublesome Creek seems to be the only stream near enough to the Rampart mines that has sufficient run-off and gradient to be worth considering as a possible source of hydroelectric power to be transmitted to that region. The approximate average grade of the stream below the mouth of Quail Creek is 45 feet per mile, ranging from 150 feet per mile at the upper limit to 18 feet per mile at the mouth.

About 7 miles from the head Troublesome Creek receives Quail Creek, its first important tributary. Quail Creek heads opposite Hoosier Creek and flows eastward, draining the north slope of Wolverine Mountain. (See Pl. VII, *A*.) It is about 5 miles long and drains an area of 20.6 square miles. The south slope of its basin is rocky and barren, rising precipitously to the summit of Wolverine Mountain. On the north the valley has a very gentle approach and is covered with a heavy growth of wild grass which furnishes excellent forage for pack animals. In its upper portion the stream is lined with a dense growth of willows, and near the mouth is a growth of spruce suitable for cabin building and for fuel. A trail from Rampart to the mouth of Quail Creek, a distance of about 20 miles, follows up the right side of Little Minook Creek, crosses the divide, and passes diagonally down the long, gentle slope on the left side of Quail Creek.

South Fork joins Quail Creek about a mile above Troublesome Creek and is its largest tributary.

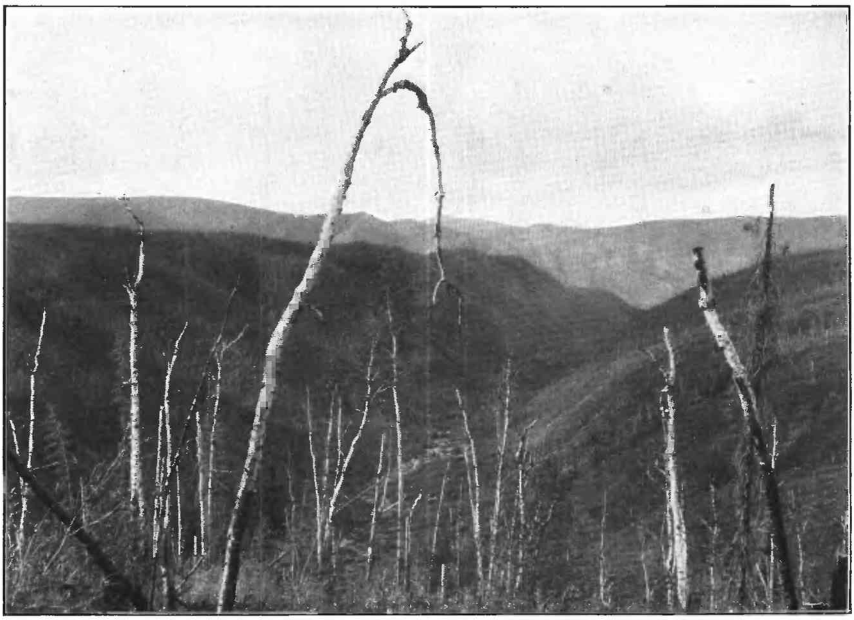
TROUBLESOME CREEK BELOW QUAIL CREEK.

This station was established August 12, 1908, on Troublesome Creek. The gage is a vertical staff driven in the left bank of the creek a short distance below the mouth of Quail Creek. Channel conditions remained fairly constant during 1908. In 1909 the conditions were not so stable, and some of the estimates may be subject to considerable error. No discharge measurements were made during 1910, and though, according to the observer, the channel did not shift appreciably and the gage datum remained constant, there is no actual check on the estimates and they should be used with care.

Discharge measurements of Troublesome Creek below Quail Creek in 1908-9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
Aug. 12	0.75	7.2	July 26	1.82	64
14	.73	6.2	27	1.45	78
Sept. 2	1.07	25	28	1.73	119
3	1.20	36	Sept. 6	.80	13.6
4	1.30	50			

A. QUAIL AND TROUBLESOME CREEKS. WOLVERINE MOUNTAIN IN THE DISTANCE.



B. LITTLE MINOOK CREEK.

Daily gage height, in feet, and discharge, in second-feet, of Troublesome Creek below Quail Creek for 1908–1910 and 1912.

[Drainage area, 43.2 square miles. Observer, C. F. W. Cassidy.]

Day.	1908				1909							
	August.		September.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.86	11.2			1.04	32		158	0.92	22
2			1.04	23			1.12	40	1.92	153		20
3			1.20	38			1.28	58	1.80	132		17.0
4			1.30	48			1.20	48	2.12	191		15.0
5				46	2.40	252		34	3.70	600	.80	13.0
6				43		250	1.00	28	2.48	271	.78	12.2
7				41	2.38	248	1.60	100	1.84	139	.77	11.8
8				38	2.50	276	1.48	83	2.00	167	.76	11.4
9				35		246	1.48	83	3.61	573	.76	11.4
10				32	1.70	115	1.30	60	2.70	325		11.0
11			1.11	29		110	1.40	73	2.28	225	.74	10.6
12	0.75	7.0	1.10	28	2.70	325	1.28	58	2.00	167	.74	10.6
13		6.7	1.03	22	2.50	276		38	1.58	97		
14	.73	6.4	.90	13.4		240	1.00	28	1.40	73		
15		6.3		13.0	2.50	276		24	1.32	63		
16	.72	6.2		12.6	2.60	300	.90	20	1.20	48		
17	.75	7.0		12.2	2.62	305		40	1.30	60		
18	.78	8.0		10.9		275	1.30	60	1.32	63		
19	.79	8.3		10.6		250		44		56		
20	.79	8.3		10.3	2.25	218	1.00	28	1.20	48		
21	.78	8.0		10.0	2.20	207	.92	22	1.18	46		
22	.78	8.0		9.8	2.28	243	.88	18.6	1.16	44		
23	.75	7.0	.82	9.6	2.52	281		394	1.08	36		
24	.73	6.4	.68	5.2	3.20	454		238	1.00	28		
25	.75	7.0	.60	4.0	2.90	375		63	.96	25		
26	.78	8.0			2.30	230	1.32	63	.94	23		
27	.75	7.0			2.20	207	1.38	70	.92	22		
28		8.0			2.12	191	1.58	97	.90	20		
29	.82	9.4				140		88	.86	17.2		
30	.80	8.6				90	1.45	80		16.5		
31	.78	8.0					1.98	163	.84	15.8		
Mean discharge		7.48		22.2		245		73		126		13.8
Second-feet per square mile		0.173		0.518		5.67		1.69		2.92		0.32
Run-off (depth in inches on drainage area)		0.13		0.48		5.48		1.95		3.37		0.14
Maximum		8.6		48		454		394		600		22
Minimum		6.2		4.0		90		18.6		15.8		10.6
Accuracy		A		A		C		C		C		A

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
May 27	2.70	325	June 10	2.10	187
29	3.20	454	Aug. 1	.90	20
31	4.02	696	10	.86	17
June 3	4.06	708	18	4.00	690
6	2.50	276	Sept. 2	1.90	149

QUAIL CREEK AT CLAIM "NO. 7 ABOVE."

This station was established June 5, 1909, and readings were taken about every four or five days until September 6. The particular object for which records were obtained was to determine if the water that could be diverted at that point would be sufficient for hydraulicking the stream and bench gravels below. The records show that except during seasons of considerable rainfall the supply would be inadequate for any such purpose unless storage was provided. The relation between gage height and discharge was probably constant during the maintenance of this station. The discharge measurements may be somewhat in error because of a rather rough channel at the measuring station.

Discharge measurements of Quail Creek at claim "No. 7 above" in 1909.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
July 27	1.10	13.3
28	1.20	20
Sept. 6	.58	1.6

Daily gage height, in feet, and discharge, in second-feet, of Quail Creek at claim "No. 7 above" for 1909.

[Drainage area, 8.5 square miles. Observers, J. A. Laird and Peter Ryden.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1				16		5.0		3.5
2				17	1.10	13.5		3.0
3			1.25	24		15		2.0
4				24		50	0.60	1.7
5	1.90	103		18	2.20	152		1.6
6		96		15		74	.58	1.6
7		88		28		50		
8		82		29		40		
9		74		24	2.40	188		
10	1.65	66		21	1.45	43		
11		63	1.10	13.5	1.25	24		
12		61		11		25		
13		58		8.5		26		
14		56	.92	6.5		27		
15	1.55	54		6.0		28		
16		52		5.0	1.30	28		
17		50		5.0		22		
18		48	1.00	9.0		16		
19		46		8.0		10		
20	1.45	43		6.0	.90	5.9		
21		37		4.0		5.1		
22		40	.78	3.5		4.4		
23		77	2.25	161	.80	3.7		
24	2.40	188	1.45	43		3.2		
25		150		10		2.6		
26		76		10	.65	2.1		
27		72	1.08	12.6		2.0		
28		36	1.20	20		1.8		
29	1.35	33		14	.60	1.7		
30		30	1.00	9.0		1.7		
31				7.0		1.7		
Mean discharge		68		19.0		28		2.2
Second-feet per square mile		8.00		2.24		3.29		0.26
Run-off (depth in inches on drainage area)		7.74		2.58		3.79		0.06
Maximum		188		161		188		3.5
Minimum		30		3.5		1.7		1.6

NOTE.—Discharge curve fairly well defined below 30 second-feet. Discharges on days of missing gage heights estimated by aid of records at Quail Creek at claim "No. 9 below."

QUAIL CREEK AT CLAIM "NO. 9 BELOW."

An attempt was made to install a gage on Quail Creek at claim "No. 9 below" on May 23, 1909, but owing to ice in the creek channel and frozen ground it was not found possible until June 6, when a staff gage was securely placed near the right bank of the creek several hundred feet above its junction with Troublesome Creek.

The discharges for 1909 are well defined below 100 second-feet. Those of 1910 may be considerably in error as no measurements were made that season. The 1909 rating curve was used. The observer reported that channel conditions and gage datum apparently remained constant.

Discharge measurements of Quail Creek at claim "No. 9 below" in 1909.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 23	....	72	May 27	1.76	60
July 2	1.58	35	28	1.84	71
26	1.58	34	Sept. 6	1.12	7.2

Daily gage height, in feet, and discharge, in second-feet, of Quail Creek at claim "No. 9 below" for 1909–10.

[Drainage area, 20.2 square miles. Observer, C. F. W. Cassidy.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.								
1	....	....	1.41	20	1.60	37	1.42	21
2	....	....	1.42	21	1.90	84	1.38	18.3
3	....	....	1.54	31	1.92	88	1.16	8.4
4	....	....	1.55	32	2.19	147	....	7.8
5	....	....	1.46	24	2.78	323	1.12	7.3
6	....	....	1.41	20	2.20	151	1.11	7.1
7	2.10	128	1.59	36	1.95	94	1.11	7.1
8	2.13	134	1.61	38	1.92	88	1.10	6.8
9	2.07	120	1.53	30	3.00	394	1.10	6.8
10	1.85	74	1.49	26	2.20	151	1.08	6.5
11	1.83	71	1.59	36	2.04	113	1.06	6.2
12	2.06	118	1.57	34	1.88	80	1.04	5.8
13	2.12	132	1.47	25	1.77	60	....	....
14	2.00	104	1.40	19.5	1.66	44	....	....
15	2.10	128	1.38	18.3	1.62	39	....	....
16	1.95	94	1.30	13.5	1.56	33	....	....
17	2.07	120	1.28	12.7	1.56	33	....	....
18	2.05	116	1.51	28	1.56	33	....	....
19	1.96	96	1.51	28	1.53	30	....	....
20	2.05	116	1.42	21	1.49	26	....	....
21	1.98	100	1.29	13.1	1.48	26	....	....
22	2.02	109	1.26	11.9	1.46	24	....	....
23	2.14	137	2.30	179	1.39	18.9	....	....
24	2.50	238	....	108	1.36	17.1	....	....
25	2.37	199	1.60	37	1.33	15.3	....	....
26	2.06	118	1.60	37	1.31	14.1	....	....
27	2.04	113	1.68	47	1.28	12.7	....	....
28	1.65	43	1.82	69	1.24	11.1	....	....
29	1.54	31	1.66	44	1.20	9.5	....	....
30	1.53	30	1.85	74	....	9.5	....	....
31	....	....	1.72	52	1.20	9.5	....	....
Mean discharge	....	111	....	38.3	....	71.5	....	9.09
Second-feet per square mile	....	5.50	....	1.88	....	3.51	....	0.450
Run-off (depth in inches on drainage area)	....	4.91	....	2.17	....	4.05	....	0.21
Maximum	....	238	....	179	....	394	....	21
Minimum	....	30	....	11.9	....	9.5	....	5.8
Accuracy	....	C	....	B	....	C	....	B

Daily gage height, in feet, and discharge, in second-feet, of Quail Creek at claim "No. 9 below" for 1909–10—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1				20	1.20	9.5	1.60	37
2				16		8	1.56	33
3				12		7	1.60	37
4				8		6	1.56	33
5			1.00	5.2	1.00	5.2	1.50	27
6	1.98	100		6		5	1.48	26
7		96		6		5		
8		90		6	1.00	5.2		
9	1.90	84		6	1.02	5.5		
10	1.85	74		6	1.00	5.2		
11	1.82	69		5	1.00	5.2		
12	1.80	65		5		6		
13	1.73	54		5		8		
14	1.59	36		5		10		
15	1.60	37		5	1.25	11.5		
16	1.62	39	1.00	5.2	1.30	13.5		
17	1.66	44		5	2.30	179		
18	1.65	43	.92	4.8	2.80	329		
19	1.62	39	.92	4.8	2.90	362		
20	1.76	59	1.35	16.5	2.50	238		
21	1.90	84	2.70	298	2.00	104		
22	1.86	76	1.95	94	1.90	84		
23	2.20	151	1.70	49	1.80	65		
24	1.65	43		43	1.80	65		
25	1.70	49	1.60	37	1.70	49		
26	2.35	193		33	1.62	39		
27	1.80	65		28	1.60	37		
28	1.71	51	1.45	23	1.50	27		
29	1.56	33		20	1.50	27		
30	1.45	23		15	1.52	29		
31			1.22	10.3	1.48	26		
Mean discharge		67.9		25.9		57.3		32.2
Second-feet per square mile		3.36		1.28		2.84		1.59
Run-off (depth in inches on drainage area)		3.12		1.48		3.27		0.35
Maximum		193		298		362		37
Minimum		23		5		5		26
Accuracy		D		D		D		D

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous measurements were made in Troublesome Creek drainage basin from 1908 to 1909:

Miscellaneous measurements in Troublesome Creek drainage basin in 1908 and 1909.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 12, 1908	Troublesome Creek	Hess Creek	Above Quail Creek	2.5	21.4	0.12
Sept. 6, 1909	do	do	do	6.8	21.4	.32
Aug. 12, 1908	Quail Creek	Troublesome Creek	Above South Fork	2.8	13.3	.21
Do	do	do	Above Nugget Gulch	4.3	17.6	.24
Do	South Fork of Quail Creek.	Quail Creek	Mouth	1.4	3.7	.38
July 27, 1909	do	do	do	9.6	3.7	2.59
Do	Nugget Gulch	do	do	2.7	2.7	1.00

MINOOK CREEK DRAINAGE BASIN.

DESCRIPTION.

Minook Creek heads on the northern slope of Eureka Dome, flows northeastward for about 4 miles, and then takes a northerly course through a remarkably straight valley to Yukon River, which it joins just above Rampart. It is about 25 miles long and drains an area of 198 square miles, the major portion being on the east of the stream. The basin is covered with a light growth of timber which furnishes a fair supply of fuel but very little suitable for milling.

The chief tributaries are Chapman, Hoosier, Little Minook Junior, Little Minook, and Hunter creeks from the east and Granite, Ruby, and Slate creeks from the west. Above Granite Creek the valley is narrow and V-shaped; below that point it broadens out and has perhaps a maximum width of one-half mile. The western slope is precipitous throughout its entire length, while the eastern slope below Chapman Creek is more gradual, with prominent benches. In the upper course the stream is crooked, meandering from one side of the valley to the other; the lower part is comparatively straight.

The summer and winter trails from Rampart to Eureka coincide through the greater part of the distance—to a point about 2 miles above Granite Creek, where the summer trail crosses the creek and passes on to the divide between Eureka and Pioneer creeks, and the winter trail keeps to the left of Minook Creek, crosses the divide to the west of Eureka Dome, and passes down the right bank of Boston Creek. The trail is very difficult, owing to the large quantity of ground ice along its left bank, which keeps it saturated even during the driest part of the summer season.

Hess says: [1]

> Just below the mouth of Slate Creek the Minook spreads into a number of branches in a wide gravel flat. This flat, which is typical of many Alaskan streams, is probably due to a change in the grade of the creek. The stream here is unable to carry the gravels of the swifter water above, and so spreads them upon the flat. Here are found the so-called "winter glaciers," which sometimes last through the short summers. In 1904 a quarter or half acre of ice still remained when the September frosts occurred. This ice owes its origin to the fact that the channel which carries the water is greatly contracted by freezing in the fall. The resulting hydrostatic pressure cracks the ice and the water overflows and freezes. This process is repeated until a considerable thickness of ice is accumulated.

Granite Creek rises opposite Allen Creek in the Baker-Minook divide and flows northeast, entering Minook Creek about 16 miles from the Yukon. It is about 8 miles long and is the third largest tributary of Minook Creek. The lower valley is V-shaped, with steep rocky slopes, and the bed is of heavy bowlders intermixed with gravel. The upper valley was not visited.

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[1] Hess, F. L., The Rampart placers: U. S. Geol. Survey Bull. 337, pp. 67-68, 1908.

Chapman Creek enters Minook Creek from the east about a mile below Granite Creek. It heads on the north slope of Elephant Mountain and is about 5 miles long.

Slate Creek is tributary to Minook Creek about 12 miles from the Yukon. It heads on the north slope of Baldy Mountain and has a length of 5 miles, with an average grade of nearly 350 feet per mile. The valley is V-shaped near the mouth and asymmetric toward the the headwaters of the stream, with rugged slopes well covered with timber.

Ruby Creek enters Minook Creek about 8 miles from the Yukon and 3 miles above the mouth of Hoosier Creek. Its course is northeastward, parallel to that of Slate Creek. It is about 8 miles long. The valley is sharp cut and asymmetric. The right side has several small tributaries, while the left is broken only by mere hills.

Hoosier Creek rises in the high divide near the head of Chapman Creek and flows northwestward, emptying into Minook Creek from the right. Warm springs in the creek bed 3 or 4 miles above the mouth maintain a considerable flow during the winter and increase the low-water flow in the summer. The resulting accumulation of large bodies of ice hampers mining operations during the spring and early in the summer.

Little Minook Junior Creek drains a small area between Hoosier and Little Minook creeks. It is about 2½ miles long. The lower valley has a heavy grade and is sharply V-shaped. The upper valley has more gentle slopes and a lower stream gradient. It probably seldom furnishes a sluice head of water except during the spring run-off.

Little Minook Creek is tributary to Minook Creek about 5 miles from the Yukon. Its drainage basin lies between Hunter and Hoosier creeks and is nearly surrounded by them. The course of the stream is parallel to that of Hunter Creek, with the same pronounced bend to the left about 3 miles from its mouth. The valley is sharply V-shaped with precipitous slopes, sparsely covered with small timber. (See Pl. VII, *B*.) This stream has been the largest producer of the Minook basin, but it has been worked in a rather unsystematic manner on account of the many different owners. Underground water also has caused considerable trouble, making it necessary to abandon some ground known to be rich. During several weeks each summer the natural flow of the stream is inadequate for ordinary mining. Some study has been made of the feasibility of bringing an auxiliary water supply from either Minook or Hoosier creek. Surveys would probably show that a considerable flow could be maintained from such an outside supply without any great engineering difficulties, but either long ditches or tunnels would have to be constructed and the resulting cost would no doubt be prohibitive.

Hunter Creek, the largest tributary of Minook Creek, enters it from the right about 3 miles from its mouth. It flows northward to its junction with Fortyseven Pup, where it makes a right-angle turn to the west, entering Minook Creek about 6 miles farther on. It is a crooked stream about 12 miles long, and has a narrow V-shaped valley and rough precipitous slopes. The lower part of the valley on the right side is marked by a very pronounced bench, which so far has furnished the chief gold-bearing gravels. Hunter Creek has a particularly heavy growth of timber, much of which would be suitable for saw logs.

MINOOK CREEK ABOVE LITTLE MINOOK CREEK.

This station, which is located just above the mouth of Little Minook Creek, was established May 25, 1908, by M. E. Koonce. The gage is a vertical staff nailed to the right-shore support of a footbridge. It was read by miners on their way to and from Rampart.

Discharge measurements of Minook Creek above Little Minook Creek, 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1908—Contd.	*Feet.*	*Sec.-ft.*	1909—Contd.	*Feet.*	*Sec.-ft.*
Aug. 9	1.58	31	Sept. 14	1.86	50	May 14	3.70	387
16	1.50	30	15	1.85	50	18	4.58	2,040
Sept. 5	2.50	110	19	2.25	82	July 29	4.20	112
7	2.25	82				Aug. 1	3.95	88
10	2.15	71	1909.			Sept. 7	2.91	47
12	1.91	57	May 14	2.85	179			

Daily gage height, in feet, and discharge, in second-feet, of Minook Creek above Little Minook Creek for 1908-9.

[Drainage area, 130 square miles. Observers, M. E. Koonce and others.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.										
1			3.60	377	2.20	79	1.60	33	1.70	37
2			3.60	377		72		34		50
3				300		66		36		100
4				250		60	1.70	37	2.65	144
5				220		54	1.70	37	2.50	120
6				200	1.90	48		36	2.35	98
7			2.90	189		76		35	2.25	86
8				180	2.40	105		34	2.29	91
9			2.80	170	2.50	120	1.60	33	2.20	79
10			2.50	120	2.20	79	1.57	32	2.15	73
11				100		76	1.55	32		60
12				150		73		32	1.90	48
13				200		69		32		46
14				250		65	1.55	32	1.85	45
15				300		61	1.50	30	1.85	45
16				290		57	1.50	30		45
17				280		53		31		50
18				270		49		32	2.25	86
19				260		45		33		70
20			3.20	255		41		34		60
21			2.92	193	1.70	37	1.65	35		50
22				160		37		34	1.80	42
23				140		36		34		
24			2.55	128		36	1.60	33		
25	4.70	2,240		110		36	1.65	35		
26	4.10	740		90		35	1.60	33		
27	4.90	3,000	2.20	79	1.65	35		33		
28		2,000		79		35		33		
29		1,000		79		34		33		
30	4.15	810	2.20	79		34		33		
31	4.25	970				33		33		
Mean discharge		1,540		196		56.0		33.4		69.3
Second-feet per square mile		11.8		1.51		0.431		0.257		0.533
Run-off (depth in inches on drainage area)		3.07		1.68		0.50		0.30		0.44
Maximum		3,000		377		120		37		144
Minimum		740		79		33		30		37
Accuracy		C		B		A		A		A

NOTE.—The discharges for days of missing gage heights were estimated by aid of comparative hydrographs.

Daily gage height, in feet, and discharge, in second-feet, of Minook Creek above Little Minook Creek for 1908–9—Continued.

Day.	May.		June.		Day.	May.		June.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1909.					1909.				
1			4.3	1,060	21	3.9	540		
2				1,100	22		490		
3			4.35	1,160	23	3.75	448		
4			4.3	1,060	24		2,300		
5				940	25	5.2	4,200		
6				810	26	4.8	2,600		
7			4.05	685	27	4.1	740		
8			3.8	475	28	4.1	740		
9				500	29	4.3	1,060		
10				520	30	4.25	970		
11			3.9	540	31	4.35	1,160		
12			4.0	630					
13	3.05	221	4.3	1,060	Mean discharge		1,290		787
14	3.25	268	4.0	630					
15		865	4.0	630	Second-feet per square mile		9.90		6.05
16		1,460							
17	4.65	2,060			Run-off (depth in inches on drainage area)		6.96		3.38
18	4.7	2,240			Maximum		4,200		1,160
19	4.4	1,280			Minimum		221		475
20	4.15	810			Accuracy		D		D

NOTE.—Gage heights were kept until Sept. 8, but it is not thought advisable to make daily estimates after June 15 because of extreme shifting-channel conditions.

HOOSIER CREEK AT CLAIM "NO. 11 ABOVE."

This station was established August 16, 1908, on claim "No. 11 above." The gage is a vertical staff driven into the right bank of the stream about one-half mile below a hydraulic plant that was in operation most of the time during the period covered by the records. Considerable fine material was washed past the gage from the mine above, but it did not appear to affect the records appreciably.

Three different rating curves were used, one in 1908, a second from May 13 to 16, 1909, and the third from May 17 to September 8, 1909.

A hydraulic plant was in operation near claim "No. 14 above" for several seasons, but it is understood that it has not been used since 1909. Water was diverted from the creek about 2 miles above and carried in 22-inch riveted steel pipe to the mine, where a 200-foot head was used to operate a 12-inch elevator having a 16-foot lift.

These records show closely the water that was available for diversion at the intake, as the creek receives no tributaries of importance between that point and the gage.

Discharge measurements of Hoosier Creek at claim "No. 11 above" in 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*	1909—Contd.	*Feet.*	*Sec.-ft.*
Aug. 16	0.35	4.7	May 14	0.85	88	July 29	1.02	25
Sept. 5	.65	21	14	1.10	162	Aug. 1	.95	18.7
9	.57	14.5	17	2.4	729	Sept. 7	.75	6.8
14	.43	7.2	18	1.85	346			

Daily gage height, in feet, and discharge, in second-feet, of Hoosier Creek at claim "No. 11 above" for 1908–9.

[Drainage area, 25.7 square miles. Observer, M. E. Koonce.]

Day.	August.		September.		Day.	August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1908.					1908—Con.				
1			0.40	8.0	21		4.7	0.35	4.7
2				25	22		4.7		
3			.85	42	23		4.7		
4			.70	25	24		4.7		
5			.70	25	25		4.7		
6			.55	13	26		4.7		
7			.65	21	27		4.7		
8			.55	13	28		4.7		
9				11.6	29		4.7		
10			.50	10.2	30		4.7		
11				9.5	31	0.35	4.7		
12				9					
13				8.5	Mean discharge		4.70		13.6
14			.45	8					
15			.45	8	Second-feet per square mile		0.183		0.529
16	0.35	4.7	.45	8					
17	.35	4.7	.43	7.7	Run-off (depth in inches on drainage area)		0.11		0.41
18	.35	4.7	.50	10.2	Maximum		4.7		42
19		4.7		9.1	Minimum		4.7		4.7
20	.35	4.7	.45	8	Accuracy		A		A

NOTE.—Rating curve well defined below 25 second-feet.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.										
1			1.45	136	0.95	18.7	0.95	18.7		6.8
2				126	.80	9.0	1.00	23		6.8
3			1.40	115	.80	9.0	.90	14.8		6.8
4			1.40	115	.80	9.0	1.10	35		6.8
5				90	.75	6.8	1.50	157		6.8
6			1.25	66	.70	5.3	1.10	35		6.8
7				60	.70	5.3		266	0.75	6.8
8			1.20	53	1.20	53		497	.75	6.8
9			1.30	78	1.00	23	2.40	729		
10			1.25	66	.75	6.8		586		
11			1.20	53	.85	11.7	2.00	443		
12			1.35	96	.80	9.0		300		
13	0.75	665		80	.75	6.8	1.50	157		
14	1.00	130	1.15	44		5.3		88		
15	2.00	540	1.10	35	.70	5.3	.95	18.7		
16	1.90	490	1.10	35	.70	5.3		18.7		
17	2.40	729	1.00	23		5.0	.95	18.7		
18	2.08	499	1.00	23		4.7		16.8		
19	1.60	205	.95	18.7		4.4	.90	14.8		
20	1.30	78		18.7	.65	4.1	.90	14.8		
21	1.20	53	.95	18.7		3.2		13.8		
22	.90	14.8	.95	18.7	.50	2.2		12.8		
23	1.08	33	.90	14.8	1.60	205	.85	11.7		
24	1.85	346	1.85	346	1.45	136		10.0		
25	2.30	656	1.80	315	1.40	115		8.4		
26	1.40	115	1.40	115	1.00	23	.75	6.8		
27	1.40	115	1.20	53	1.00	23		6.8		
28	1.40	115	1.10	35		23	.75	6.8		
29	1.45	136		29	1.00	23		6.8		
30	1.70	258	1.00	23	1.00	23		6.8		
31	1.50	157			.90	14.8		6.8		
Mean discharge		24.9		77		26		114		6.8
Second-feet per square mile		9.69		3.00		1.01		4.44		0.26
Run-off (depth in inches on drainage area)		6.85		3.35		1.16		5.12		0.09
Maximum		729		346		205		729		6.8
Minimum		14.8		14.8		2.2		6.8		6.8
Accuracy		D		C		B		C		B

NOTE.—Discharges above 50 second-feet are only approximate.

LITTLE MINOOK CREEK AT CLAIM "NO. 9 ABOVE."

Little Minook Creek has been the largest gold producer in the Rampart district. During a considerable portion of each season the water supply is insufficient for groundsluicing and washing the gravel that is shoveled into the sluice boxes. Several automatic splash dams have been used, but they are not adapted for operation on very small streams during times of low run-off, for unless constructed with more than ordinary care the seepage through and around them will be as great as the inflow and the reservoir will not fill sufficiently to operate the gate.

A gage was installed June 21, 1908, near the lower end of claim "No. 9 above" and just above the backwater from an automatic dam on claim "No. 8 above." The channel was permanent and the conditions for measuring were fairly good. The gage datum remained constant. The discharges on days on which the gage was not read were estimated by means of comparative hydrographs and are believed to be fairly accurate, particularly during periods of low water when the changes in stage were very gradual. The rating curve is well defined for all stages.

Discharge measurements of Little Minook Creek at claim "No. 9 above" in 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
Aug. 10	0.79	0.75	May 17	1.79	70
15	.79	.67	17	2.38	167
Sept. 4	1.17	6.8	22	1.38	19.6
7	.98	2.5	July 28	1.08	3.4
15	.91	1.3	Aug. 1	1.00	2.2
			Sept. 6	.83	1.3

Daily gage height, in feet, and discharge, in second-feet, of Little Minook Creek at claim "No. 9 above" for 1908-9.

[Drainage area, 5.9 square miles. Observer, Charles Nelson.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1			0.92	1.6	0.75	0.62	1.08	4.2
2			.92	1.6	.83	.86	1.17	6.8
3			.92	1.6		.8	1.21	8.3
4			.83	.86		.8	1.17	6.8
5			.83	.86		.8		5
6			.92	1.6		.8		3
7			1.08	4.2		.7	.98	2.3
8			1.50	32		.7		2
9			1.42	23		.7		2
10			1.33	15.7	.79	.70		2
11			1.33	15.7		.7		2
12				10		.7		2
13				5		.7		2
14			.92	1.6		.7		2
15			.83	.86	.79	.70	.91	1.4
16			.83	.86		.7		
17			.75	.6		.8		
18			.75	.6	.83	.86		
19				.6		.9		
20				.6		.9		
21	1.17	6.8		.6		.9		
22	1.08	4.2		.6		.9		
23	1.00	2.6		.6		.9		
24	.92	1.6		.6		.9		
25	.92	1.6		.6		.9		
26	.92	1.6		.6		.9		
27	.92	1.6		.6		.9		
28	.92	1.6		.6		.9		
29	.92	1.6		.6		.9		
30	.92	1.6		.6		.9		
31			.75	.6	.83	.86		
Mean discharge		2.48		4.07		.806		3.45
Second-feet per square mile		0.420		0.690		0.137		0.585
Run-off (depth in inches on drainage area)		0.16		0.80		0.16		0.33
Maximum		6.8		32		0.9		8.3
Minimum		1.6		0.6		0.62		1.4
Accuracy		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Little Minook Creek at claim "No. 9 above" for 1908-9—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.										
1			1.50	32		2	1.00	2.6	0.75	0.62
2				28		2		3		.6
3				25		2		3		.6
4				23		2	1.00	2.6	.75	.62
5				21	0.92	1.6	1.46	28		.7
6				19		2		33	.83	.86
7				17		10		38		.9
8			1.33	15.7	1.46	28		43		.9
9				17		20	1.62	47		1
10				20		10	1.79	70		1
11				22	.75	.62	1.66	52		1
12				25		.7		47		1
13			1.46	28		.7		42		1
14				10		.7		37		1
15			1.00	2.6		.7	1.50	32	.92	1.6
16	1.79	70		2.6		.7		20		1
17	2.38	167	1.00	2.6		.7		10		1
18		100		3		.7		5	.75	.62
19		70		3		.7	.92	1.6		
20		50		3		.7		1		
21		30		3		.7	.83	.86		
22	1.42	23	1.04	3.3		.7		.8		
23		25		3	1.00	2.6		.8		
24		40		10	1.50	32		.7		
25		60	1.46	28		20	.79	.70		
26	1.83	76		50		10		.7		
27		50	1.46	28	1.00	2.6		.7		
28		40		20	1.21	8.3		.7		
29	1.54	37		10		6	.75	.62		
30		37	1.00	2.6		5		.6		
31	1.54	37				4		.6		
Mean discharge		57.0		15.9		5.76		17.0		.890
Second-feet per square mile		9.66		2.69		0.976		2.88		0.151
Run-off (depth in inches on drainage area)		5.75		3.00		1.13		3.32		0.10
Maximum		167		50		32		70		1.6
Minimum		23		2.6		0.62		0.6		0.6
Accuracy		A		A		A		A		A

HUNTER CREEK AT CLAIM "NO. 17 ABOVE."

This station was established at claim "No. 17 above" on August 11, 1908, in order to determine the amount of water available at that point for diversion for hydraulicking below. On May 17, 1909, a gage was installed at claim "No. 19 above" to take the place of the 1908 gage. Daily records were kept throughout the season, but no estimates of daily flow for 1909 can be made, as hydraulicking was commenced just above soon after the installation of the gage and the tailings from the mine blocked and shifted the channel to such an extent for unknown periods that no relation between gage height and discharge can be deduced.

Two hydraulic plants have been in operation on the creek for several years. The water for the plant on claim "No. 19 above," left limit bench, is carried in 3,300 feet of flume and 3,000 feet of ditch, when a 90-foot head is available at the monitors. The lower plant, located near Discovery claim, receives its water supply through 5,200 feet of riveted steel pipe ranging in diameter from 20 to 14 inches, 2,300 feet of flume, and 200 feet of ditch. A working head of 105 feet is available at the mine.

Discharge measurements of Hunter Creek at claim "No. 17 above" in 1908.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Aug. 11	0.50	4.5	Sept. 10	0.79	12.7
Sept. 6	.90	17.9	16	.65	8.4

Daily gage height, in feet, and discharge, in second-feet, of Hunter Creek at claim "No. 17 above" for 1908.

[Drainage area, 33.4 square miles. Observer, S. M. Wheeler.]

Day.	August.		September.		Day.	August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1			0.60	6.6	21	0.55	5.5		
2			.75	11.4	22	.50	4.5		
3			1.05	25	23	.45	3.7		
4			1.10	28	24	.50	4.5		
5			1.00	23	25	.50	4.5		
6			.90	17.9	26	.50	4.5		
7			.85	15.6	27	.50	4.5		
8			.85	15.6	28	.50	4.5		
9				14	29	.50	4.5		
10				13	30	.50	4.5		
					31	.55	5.5		
11	0.50	4.5		11					
12	.55	5.5	.70	9.6					
13	.50	4.5			Mean discharge		4.60		15.8
14	.50	4.5							
15	.50	4.5			Second-feet per square mile		0.138		0.473
16	.50	4.5							
17	.50	4.5			Run-off (depth in inches on drainage area)		0.11		0.14
18	.50	4.5			Maximum		5.5		28
19	.50	4.5			Minimum		3.7		6.6
20	.50	4.5			Accuracy		B		B

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in Minook Creek drainage basin in 1908 and 1909.

Miscellaneous measurements in Minook Creek drainage basin in 1908 and 1909.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 8, 1908	Minook Creek	Yukon River	4½ miles above Chapman Creek.	2.9	9.2	0.32
Sept. 9, 1909	do	do	Below Granite Creek	15.2	47.3	.32
Aug. 8, 1908	do	do	Below Chapman Creek.	7.1	58.3	.12
Do	Granite Creek	Minook Creek.	Mouth	5.7	26.9	.21
Sept. 9, 1909	do	do	do	5.9	26.9	.22
Aug. 8, 1908	Chapman Creek	do	do	2.9	14.8	.20
Do	Slate Creek	do	do	2.2	7.9	.28
Do	Ruby Creek	do	do	1.7	10.6	.16
Sept. 9, 1909	do	do	do	2.6	10.6	.25
Aug. 10, 1908	Hoosier Creek	do	Above pipe intake	4.8	21.2	.23
Sept. 9, 1908	do	do	do	11.1	21.2	.52
Do	do	do	Below pipe intake	1.2		
Sept. 5, 1908	Little Minook Junior Creek.	do	Mouth	.32	1.3	.25
May 16, 1909	Hunter Creek	do	Claim "No. 19 above".	1,000	34.4	29.07
May 19, 1909	do	do	do	326	34.4	9.48
July 30, 1909	do	do	do	28	34.4	.81
Aug. 2, 1909	do	do	do	21	34.4	.61
Sept. 10, 1909	do	do	do	5.8	34.4	.17
Aug. 10, 1908	do	do	Claim "No. 14 above".	2.3	33.4	.069

SQUAW CREEK.

Squaw Creek enters Yukon River from the north just above Rampart, directly opposite Minook Creek. The creek was not seen above the mouth, but the upper valley is said to have a valuable growth of timber. Considerable winter prospecting has been done, but no values are reported. A measurement made September 11, 1908, at the mouth, gave a discharge of 27.7 second-feet.

RUSSIAN CREEK.

Russian Creek enters Yukon River from the south about 4 miles below Rampart. It has an asymmetric valley with steep slopes and a rather broad bottom land, thickly covered with small trees. It is about 8 miles long and flows generally north.

A measurement was made about 3 miles above the mouth on September 19, 1908, as follows:

Discharge, 1.9 second-feet; drainage area, 9.9 square miles; discharge, 0.192 second-foot per square mile.

TANANA RIVER DRAINAGE BASIN.

DESCRIPTION.

Tanana River is formed by the junction of Nabesna and Chisana rivers, which rise in large glaciers on the northern slope of the Wrangell Mountains. It flows northwestward with a valley length of over 400 miles and enters the Yukon at longitude 152°, latitude 65° 10′, draining an area of about 43,000 square miles. The basin is bounded on the south by the Alaska Range, from whose high snow-capped mountains it receives its largest tributaries and greatest run-off. Brooks[1] states that "the Tanana Valley falls into three physiographic provinces, which can be conveniently used for purposes of description. The broad lowland near the head is called the 'upper Tanana,' the constricted part of the valley between Tetling and Delta rivers is termed the 'middle Tanana,' while the broad portion between the Delta and the mouth will be designated the 'lower Tanana'." Stream-flow data from this basin are confined to those entering within the "Lower Tanana" province from the north. There the river keeps the north side of the valley and flows in several channels through much of its course.

The Delta, Nenana, and Kantishna are the largest tributaries of the Tanana from the south. From the north Goodpaster, Salcha, Chena, and Tolovana rivers are the main branches.

TANANA RIVER AT McCARTYS.

At McCartys, just above Delta River, which is 95 miles above Fairbanks by the Government road, the Tanana flows in three channels except at extreme low water, when the middle one is dry. During the summer of 1909 the Alaskan Road Commission installed ferries on the right and left channels and bridged the center one.

An attempt was made to obtain daily gage heights of the river at this point and a gage was installed on the left or main channel above the ferry on July 9, 1909, but no records were received. Two measurements of discharge were made during the summer, the results of which are shown in the following table:

Discharge measurements of Tanana River at McCartys in 1909.

Date.	Main channel.			Three channels.			Gage height.	Discharge.	Drainage area.	Discharge per square mile.
	Width.	Area of section.	Mean velocity.	Width.	Area of section.	Mean velocity.				
	Feet.	*Sq. ft.*	*Ft. pr. sec.*	*Feet.*	*Sq. ft.*	*Ft. pr. sec.*	*Feet.*	*Sec.-ft.*	*Sq mi.*	*Sec.-ft.*
July 9	610	4,820	5.04	916	6,530	4.23	4.95	27,600	13,900	1.99
Aug. 28	580	3,980	4.73	766	5,170	4.12	3.95	21,300	13,900	1.53

TANANA RIVER BELOW CHENA.

In order to obtain information regarding the winter run-off of the Tanana a discharge measurement was made $3\frac{1}{2}$ miles below the town

[1] Brooks, A. H., The geography and geology of Alaska: U. S. Geol. Survey Prof. Paper 45, p. 83, 1906.

of Chena, where the water was confined to one channel. Twenty-one holes were cut through ice from 1.9 to 4.2 feet thick. Large quantities of slush ice beneath the main ice sheet seriously interfered with the determination of the velocity at several of the sections, but the discharge is believed to be fairly accurate. The results of the measurements were as follows:

Discharge, 4,450 second-feet; drainage area, 24,000 square miles; discharge per square mile, 0.185 second-foot; width, 417 feet; area of section, 2,440 square feet; mean velocity, 1.82 feet per second.

BANNER CREEK AT MOUTH.

This station, which is located at the highway bridge in the town of Richardson, was established July 6, 1909. The channel was composed of sand and small gravel and was liable to large changes during high water. The discharges for 1909 are based on one rating curve, and those for 1910 on two curves—the first applicable from June 20 to July 30, the second from July 31 to September 30. No definite relation exists between the 1909 and the 1910 gage heights.

Banner Creek enters the Tanana from the north about 70 miles above Fairbanks. Buckeye Creek is its main tributary. Considerable placer mining has been done in this basin.

Discharge measurements of Banner Creek at mouth in 1909–10.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1909.	*Feet.*	*Sec.-ft.*	1910.	*Feet.*	*Sec.-ft.*
July 6	1.33	11.5	June 20	0.94	4.2
7	1.22	9.2	Aug. 17	.78	4.9
10	1.12	5.8	18	.87	8.0
Aug. 27	1.25	9.9			
29	1.21	7.5			

Daily gage height, in feet, and discharge, in second-feet, of Banner Creek at mouth for 1909–10.

[Drainage area, 21.5 square miles. Observer, J. W. McCloskey.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.						
1					1.20	7.8
2					1.15	6.6
3					1.15	6.6
4					1.15	6.6
5					1.15	6.6
6	1.30	10.6			1.15	6.6
7	1.15	6.6			1.15	6.6
8	1.30	10.6			1.10	5.4
9	1.10	5.4			1.10	5.4
10	1.15	6.6			1.20	7.8
11	1.10	5.4			1.15	6.6
12	1.10	5.4			1.15	6.6
13	1.30	10.6			1.10	5.4
14	1.30	10.6			1.15	6.6
15	1.25	9.2			1.15	6.6
16	1.20	7.8			1.15	6.6
17	1.20	7.8			1.35	12.2
18	1.20	7.8			1.25	9.2
19	1.10	5.4			1.20	7.8
20	1.05	4.3			1.15	6.6
21	1.00	3.3			1.15	6.6
22	1.00	3.3			1.15	6.6
23	1.10	5.4			1.15	6.6
24	1.10	5.4			1.20	7.8
25	1.08	5.0			1.05	4.3
26	1.05	4.3			1.05	4.3
27	1.10	5.4	1.25	9.2		
28	1.30	10.6	1.25	9.2		
29	1.50	17.2	1.25	9.2		
30	1.80	29	1.20	7.8		
31			1.20	7.8		
Mean discharge		8.12		8.64		6.78
Second-feet per square mile		0.378		0.402		0.315
Run-off (depth in inches on drainage area)		0.35		0.07		0.31
Maximum		29		9.2		12.2
Minimum		3.3		7.8		4.3
Accuracy		C		B		C

NOTE.—Gage taken out by high water July 31, 1909; replaced at same location Aug. 27.

Daily gage height, in feet, and discharge, in second-feet, of Banner Creek at mouth for 1909–10—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			1.00	6.1	1.20	19.3	0.85	7.2
2			.93	4.0	1.05	14.0	.87	7.8
3			.90	3.1	1.00	12.2	.90	8.8
4			.90	3.1	.90	8.8	.95	10.5
5			1.05	7.8	.85	7.2	.97	11.2
6			1.05	7.8	.80	5.6	.95	10.5
7			1.05	7.8	.80	5.6	.95	10.5
8			1.00	6.1	.78	5.0	.93	9.8
9			.95	4.6	.78	5.0	.90	8.8
10			.95	4.6	.78	5.0	.87	7.8
11			.90	3.1	.78	5.0	.87	7.8
12			.90	3.1	.75	4.2	.90	8.8
13			.90	3.1	.75	4.2	1.00	12.2
14			.87	2.5	.70	2.7	.97	11.2
15			.87	2.5	.70	2.7	.97	11.2
16			.84	2.0	.80	5.6	1.15	17.5
17			.87	2.5	.78	5.0	1.10	15.7
18			.87	2.5	.80	5.6	.90	8.8
19			.87	2.5	.92	9.6	1.00	12.2
20	0.95	4.6	.87	2.5	1.02	12.9	.95	10.5
21	.93	4.0	.87	2.5	.95	10.5	.90	8.8
22	.93	4.0	.90	3.1	.92	9.6	.95	10.5
23	.93	4.0	1.15	11.1	.90	8.8	1.00	12.2
24	.93	4.0	1.15	11.1	.90	8.8	1.05	14.0
25	.93	4.0	.95	4.6	.88	8.2	1.10	15.7
26	1.22	13.5	.90	3.1	.88	8.2	1.08	15.0
27	1.05	7.8	.90	3.1	.87	7.8	1.05	14.0
28	1.05	7.8	.87	2.5	.87	7.8	1.10	15.7
29	1.05	7.8	.90	3.1	.85	7.2	1.05	14.0
30	1.05	7.8	1.50	23	.85	7.2	1.00	12.2
31			1.40	26	.85	7.2		
Mean discharge		6.30		5.63		7.63		11.4
Second-feet per square mile		0.293		0.262		0.355		0.530
Run-off (depth in inches on drainage area)		0.12		0.30		0.41		0.59
Maximum		13.5		26		19.3		17.5
Minimum		4.0		2.0		2.7		7.2
Accuracy		D		D		C		C

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made on minor tributaries of Tanana River:

Miscellaneous measurements of minor tributaries of Tanana River, 1909–10.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
July 11, 1909	Banner Creek	Tanana River	Above Buckeye Creek	3.3	13.8	0.24
Aug. 27, 1909	do	do	do	2.4	13.8	.17
July 6, 1909	Buckeye Creek	Banner Creek	Mouth	5.2	6	.87
July 11, 1909	do	do	do	1.8	6	.30
Aug. 27, 1909	do	do	do	4.3	6	.72
July 21, 1910	Canyon Creek	Tanana River	do	.45	4.7	.091
July 4, 1909	Little Salcha River	do	Road crossing	45	70	.64
July 13, 1909	do	do	do	62	70	.89
Aug. 25, 1909	do	do	do	33	70	.47
Aug. 30, 1909	do	do	do	27	70	.39
June 22, 1910	do	do	do	28	70	.40
Aug. 15, 1910	do	do	do	21	70	.30

SALCHA RIVER DRAINAGE BASIN.

DESCRIPTION.

Salcha River rises opposite the head of South Fork of Birch Creek, about 25 miles from the Yukon, and flows southwest with a valley length of about 125 miles and enters the Tanana about 40 miles above Fairbanks. The average fall of the river from North Fork to the mouth is 10 feet per mile, and from a point about 2 miles below the summit of the divide at the headwaters it averages 19 feet to the mile.

Redmond Creek enters the Salcha from the south 15 miles above the mouth. Junction and Mosquito creeks, which join to form Redmond Creek, drain an area 6 to 8 miles north of the Tanana and parallel to it.

SALCHA RIVER AT MOUTH.

This station was established July 4, 1909. Daily gage heights were recorded from July 4 to September 30, 1909, and from May 12 to August 19, 1910. The gage was a vertical staff driven into the right bank of the river opposite W. F. Munson's road house. The gage was set at a different elevation at the beginning of each season, but during each season its position remained constant. Measurements were made from an Alaskan Road Commission ferry located about 300 feet above the gage. The channel showed evidence of slight changes during high water, but the relation between gage height and discharge is believed to have remained fairly constant and the records should show closely the actual discharge.

Discharge measurements of Salcha River at mouth in 1909–11.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1909.	*Feet.*	*Sec.-ft.*	1910—Continued.	*Feet.*	*Sec.-ft.*
July 4	2.20	1,730	June 18	2.79	2,660
12	3.50	3,540	22	2.56	2,230
13	3.20	3,080	Aug. 16	1.33	920
Aug. 25	2.81	2,490			
			1911.		
1910.			June 25	3.35	3,910
Apr. 17		[a] 64.5	26	2.91	2,950
May 12	3.59	[b] 4,380	27	2.79	2,890
13	4.42	5,630			

[a] Measurement made through ice covering. Discharge probably about the minimum for the winter.
[b] River rapidly rising.

Daily gage height, in feet, and discharge, in second-feet, of Salcha River at mouth for 1909–10.

[Drainage area, 2,170 square miles. Observer, W. F. Munson.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.						
1			5.25	7,460	2.20	1,730
2			4.60	5,700	2.10	1,630
3			4.85	6,300	2.00	1,530
4	2.20	1,730	4.55	5,590	2.10	1,630
5	2.18	1,710	4.40	5,260	2.10	1,630
6	2.10	1,630	3.80	4,060	2.10	1,630
7	2.10	1,630	3.90	4,250	2.10	1,630
8	2.35	1,800	4.05	4,540	2.10	1,630
9	3.05	2,840	4.50	5,480	2.00	1,530
10	3.05	2,840	4.70	5,940	2.00	1,530
11	3.05	2,840	4.25	4,940	2.00	1,530
12	3.40	3,380	4.00	4,440	1.95	1,480
13	3.30	3,220	3.85	4,160	1.95	1,480
14	4.10	4,640	3.50	3,540	1.95	1,480
15	5.20	7,300	3.20	3,060	1.95	1,480
16	5.70	9,130	3.00	2,760	1.95	1,480
17	5.05	6,860	2.75	2,410	1.80	1,350
18	3.75	3,960	2.70	2,340	1.80	1,350
19	4.15	4,740	2.70	2,340	1.80	1,350
20	4.00	4,440	2.80	2,480	1.80	1,350
21	3.85	4,160	3.10	2,910	1.80	1,350
22	3.05	2,840	3.20	3,060	1.80	1,350
23	2.95	2,690	3.20	3,060	1.80	1,350
24	2.95	2,690	3.10	2,910	1.80	1,350
25	3.30	3,220	2.95	2,690	1.80	1,350
26	3.10	2,910	2.80	2,480	1.80	1,350
27	2.80	2,480	2.70	2,340	1.80	1,350
28	2.75	2,410	2.60	2,200	1.80	1,350
29	4.15	4,740	2.45	2,010	1.80	1,350
30	4.95	6,580	2.25	1,780	1.80	1,350
31	5.35	7,800	2.22	1,750		
Mean discharge		3,830		3,690		1,460
Second-feet per square mile		1.76		1.70		0.673
Run-off (depth in inches on drainage area)		1.83		1.96		0.75
Maximum		9,130		7,460		1,730
Minimum		1,630		1,750		1,350
Accuracy		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Salcha River at mouth for 1909-10—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			3.72	4,390	3.60	4,150	3.05	3,090
2			3.55	4,050	3.20	3,360	2.80	2,660
3			3.20	3,360	2.85	2,740	2.50	2,180
4			3.05	3,090	2.40	2,040	2.10	1,640
5			2.72	2,520	2.20	1,760	2.00	1,520
6			2.80	2,660	2.55	2,260	1.80	1,310
7			2.58	2,300	2.40	2,040	1.80	1,310
8			2.18	1,740	2.05	1,580	1.80	1,310
9			3.00	3,000	1.80	1,310	1.75	1,260
10			4.50	6,010	1.65	1,160	1.60	1,120
11			5.20	7,480	1.60	1,120	1.60	1,120
12	3.59	4,130	5.55	8,220	1.60	1,120	1.60	1,120
13	4.39	5,780	5.00	7,060	1.90	1,420	1.60	1,120
14	4.65	6,320	4.10	5,170	2.40	2,040	1.45	1,000
15	4.58	6,180	3.20	3,360	2.35	1,970	1.35	930
16	4.80	6,640	2.80	2,660	2.20	1,760	1.35	930
17	4.02	5,000	3.15	3,270	1.90	1,420		2,480
18	4.50	6,010	2.95	2,920	2.60	1,120		4,030
19	3.85	4,650	2.75	2,580	1.60	1,120	4.30	5,590
20	3.70	4,350		2,480	1.80	1,310		
21	3.88	4,710		2,380	1.70	1,210		
22	3.40	3,750	2.56	2,270	1.60	1,120		
23	3.10	3,180		2,550	1.60	1,120		
24	3.48	3,910	2.90	2,830	2.90	2,830		
25	4.25	5,480	2.90	2,830	4.55	6,120		
26	4.28	5,550	2.90	2,830	2.85	2,740		
27	3.55	4,050	3.50	3,950	2.65	2,410		
28	3.40	3,750	3.10	3,180	2.45	2,110		
29	3.40	3,750	3.00	3,000	2.00	1,520		
30	2.50	2,180	2.85	2,740	2.00	1,520		
31	3.90	4,750			2.70	2,490		
Mean discharge		3,040		3,560		2,000		1,880
Second-feet per square mile		140		1.64		0.920		0.866
Run-off (depth in inches on drainage area)		1.04		1.83		1.06		0.61
Maximum		6,640		8,220		6,120		5,590
Minimum		2,180		1,740		1,120		930
Accuracy		A		A		A		A

JUNCTION CREEK ABOVE MOOSE LAKE OUTLET.

This station was established on Junction Creek, July 7, 1909, near A. F. Stowe's cabin, just above Moose Lake outlet and about a mile above Redmond Creek. The channel was subject to slight changes, which would affect the low-water rating but would probably not appreciably affect the upper part of the rating curve.

Discharge measurements of Junction Creek above Moose Lake outlet in 1909 and 1910.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1909.	*Feet.*	*Sec.-ft.*	1910.	*Feet.*	*Sec.-ft.*
July 7	1.36	5.0	June 20	1.40	4.8
11	1.80	10.2	Aug. 18	1.32	5.4
Aug. 26	1.60	7.2			

Daily gage height, in feet, and discharge, in second-feet, of Junction Creek above Moose Lake outlet for 1909, 1910, and 1912.

[Drainage area, 23.6 square miles. Observer, A. F. Stowe.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.						
1	......	......	2.45	23	1.45	5.8
2	......	......	3.50	46	1.40	5.3
3	......	......	5.10	94	1.40	5.3
4	......	......	3.40	43	1.40	5.3
5	......	......	2.70	28	1.50	6.2
6	......	......	2.10	16	......	7.5
7	1.36	5.0	1.90	12	......	8.8
8	1.55	6.7	1.95	13	1.80	10
9	1.42	5.5	2.25	19	1.60	7.2
10	1.68	8.3	2.65	27	1.55	6.7
11	1.80	10	2.30	20	1.60	7.2
12	1.70	8.6	2.45	23	1.55	6.7
13	2.40	22	2.00	14	1.50	6.2
14	2.25	19	1.80	10	1.70	8.6
15	2.65	27	1.75	9.4	1.90	12
16	1.90	12	1.75	9.4	1.90	12
17	1.55	6.7	1.70	8.6	1.85	11
18	1.40	5.3	1.60	7.2	1.65	7.9
19	1.38	5.2	1.50	6.2	......	8.7
20	1.30	4.6	3.60	49	......	9.5

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909—Con.						
21	1.25	4.3	2.90	32	1.80	10
22	1.20	4.0	2.55	25	1.80	10
23	1.25	4.3	2.10	16	1.80	10
24	1.60	7.2	1.90	12	......	......
25	1.55	6.7	1.65	79	......	......
26	1.30	4.6	1.60	7.2	......	......
27	1.28	4.5	1.55	6.7	......	......
28	1.55	6.7	1.50	6.2	......	......
29	2.75	29	1.50	6.2	......	......
30	3.10	36	1.45	5.8	......	......
31	2.95	33	1.45	5.8	......	......
Mean discharge	......	11.4	......	19.6	......	8.17
Second-feet per square mile	......	0.483	......	0.831	......	0.346
Run-off (depth in inches on drainage area)	......	0.45	......	0.96	......	0.28
Maximum	......	36	......	94	......	12
Minimum	......	4.0	......	5.8	......	5.3
Accuracy	......	B	......	C	......	B

Daily gage height, in feet, and discharge, in second-feet, of Junction Creek above Moose Lake outlet for 1909, 1910, and 1912.—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.								
1			1.40	5.3	2.50	24	1.30	4.6
2			1.30	4.6	2.20	18	1.55	6.7
3			1.25	4.3	2.00	14	1.50	6.2
4			1.25	4.3	1.70	8.6	1.50	6.2
5			1.45	5.8	1.45	5.8	2.35	21
6			1.50	6.2	1.30	4.6	2.25	19
7			1.45	5.8	1.25	4.3	2.00	14
8	1.70	8.6	1.30	4.6	1.25	4.3	1.80	10
9	1.60	7.2	1.30	4.6	1.25	4.3	1.70	8.6
10	8.50	199	1.25	4.3	1.20	4.0	1.70	8.6
11	6.60	139	1.15	3.8	1.20	4.0	1.65	7.9
12	3.90	58	1.40	5.3	1.15	3.8	1.60	7.2
13	2.80	30	1.30	4.6	1.15	3.8	1.60	7.2
14	2.10	16	1.25	4.3	1.20	4.0	1.75	9.4
15	1.85	11	1.15	3.8	1.25	4.3	1.90	12
16	1.75	9.4	1.15	3.8	1.25	4.3	2.20	18
17	1.65	7.9	1.15	3.8	1.30	4.6	2.60	26
18	1.50	6.2	1.15	3.8	1.35	5.0	2.40	22
19	1.45	5.8	1.15	3.8	1.60	7.2	2.00	14
20	1.40	5.3	1.25	4.3	1.80	10	1.85	11
21	1.35	5	1.00	3	1.90	12	1.85	11
22	1.30	4.6	1.20	4	1.65	7.9		
23	1.30	4.6	1.80	10	1.50	6.2		
24	1.25	4.3	1.80	10	1.45	5.8		
25	1.20	4	2.10	16	1.45	5.8		
26	1.30	4.6	1.90	12	1.40	5.3		
27	1.40	5.3	1.70	8.6	1.40	5.3		
28	1.40	5.3	1.50	6.2	1.35	5.0		
29	1.35	5	1.30	4.6	1.30	4.6		
30	1.40	5.3	1.15	3.8	1.25	4.3		
31			2.60	26	1.25	4.3		
Mean discharge		24.0		6.30		6.75		11.9
Second-feet per square mile		1.02		0.267		0.286		0.504
Run-off (depth in inches on drainage area)		0.87		0.31		0.33		0.39
Maximum		199		26		24		22
Minimum		4.0		3.0		3.8		4.6
Accuracy		D		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Junction Creek above Moose Lake outlet for 1909, 1910, and 1912.—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1	4.3	70	2.7	28	1.25	4.3	1.4	5.4
2	5.1	94	2.6	26	1.25	4.3	1.5	6.2
3	4.3	70	2.4	22	1.25	4.3	1.5	6.2
4	3.7	52	2.2	18	1.2	4.0	1.45	5.8
5	3.1	36	2.1	16	1.2	4.0	1.4	5.4
6	2.9	32	2.9	32	1.15	3.7	1.35	5.0
7	2.3	20	1.8	10.2	1.25	4.3	1.3	4.6
8	1.9	12	1.7	8.6	1.2	4.0	1.4	5.4
9	1.6	7.2	1.6	7.2	1.25	4.3	1.35	5.0
10	1.4	5.4	1.55	6.7	1.3	4.6	1.3	4.6
11	1.35	5.0	1.45	5.8	1.4	5.4	1.3	4.6
12	3.2	38	1.45	5.8	1.3	4.6	1.3	4.6
13	3.3	40	1.45	5.8	1.3	4.6	1.25	4.3
14	2.6	26	1.45	5.8	1.3	4.6	1.25	4.3
15	5.4	103	1.4	5.4	1.25	4.3	1.3	4.6
16	9.5	250	1.4	5.4	1.2	4.0	1.3	4.6
17	4.7	82	1.4	5.4	1.2	4.0	1.3	4.6
18	3.4	43	1.4	5.4	1.15	3.7	1.3	4.6
19	6.1	124	1.35	5.0	1.15	3.7	1.3	4.6
20	3.9	58	1.4	5.4	1.15	3.7	1.35	5.0
21	3.2	38	1.45	5.8	1.15	3.7	1.35	5.0
22	2.9	32	1.45	5.8	1.15	3.7	1.4	5.4
23	6.1	124	1.4	5.4	1.15	3.7	1.45	5.8
24	10+	300	1.35	5.0	1.2	4.0	1.5	6.2
25	10+	300	1.4	5.4	1.25	4.3	1.7	8.6
26	7.7	180	1.45	5.8	1.4	5.4	1.6	7.2
27	5.1	94	1.4	5.4	1.4	5.4	1.45	5.8
28	3.7	52	1.4	5.4	1.35	5.0	1.35	5.0
29	3.1	36	1.4	5.4	1.3	4.6	1.3	4.6
30	2.7	28	1.35	5.0	1.25	4.3	1.3	4.6
31	....	....	1.3	4.6	1.3	4.6	....	....
Mean discharge	....	78.4	....	9.32	....	4.29	....	5.25
Second-feet per square mile	....	3.32	....	0.395	....	0.182	....	0.222
Run-off (depth in inches on drainage area)	....	3.70	....	0.46	....	0.21	....	0.25
Maximum	....	300	....	32	....	5.4	....	8.6
Minimum	....	5.0	....	4.6	....	3.7	....	4.3
Accuracy	....	D	....	D	....	D	....	D

NOTE.—No measurements were made in 1912. The discharges as published may be largely in error and should be considered only approximate.

CHENA RIVER DRAINAGE BASIN.

DESCRIPTION.

Chena River rises between the headwaters of South Fork of Birch Creek and Salcha River at an elevation between 4,000 and 5,000 feet. It has a length of about 100 miles and flows slightly south of west to the lowlands of the Tanana Valley, where it empties its waters into Chena Slough 10 miles above Fairbanks. It drains an area of 1,860 square miles. Its principal tributaries are Munson Creek and South Fork from the south and North Fork and Little Chena River from the north.

The part of Chena River above North Fork is sometimes called Middle Fork. It has a catchment of 540 square miles, the major part of which lies to the south. Munson Creek, its largest tributary, enters from the south about 45 miles from the head. Ottertail Creek is the largest stream from the north and enters about 8 miles above Munson Creek. Salmonfoot, Shamrock, Palmer, Teuchet, and Blackshell, in downstream order, are small branches from the south.

North Fork takes its source in the Yukon-Tanana divide at the head of Chatanika River and Harrington Fork of Birch Creek and joins the main stream about 10 miles below Munson Creek, at an elevation of a little over 800 feet. West Fork is the largest tributary of North Fork, which it enters from the right about 12 miles above the mouth. Monument Creek, the only branch of consequence from the left, unites with North Fork about 3 miles above West Fork. West Fork rises in the divide between Harrington Fork of Birch Creek and Pool Creek. Its two main tributaries are Frozenfoot and Olympia creeks.

South Fork is confluent to the Chena about 20 miles below the North Fork. It drains an irregularly shaped area somewhat smaller than the North Fork basin.

The major part of the stream-flow studies that have been carried on in this basin were on Little Chena River and its tributaries. (See pp. 251–270.)

Much of the largest and best quality of spruce lumber used in the Fairbanks mining district was taken from the Chena basin. Considerable timber remains in the larger valleys but is inferior in quality and is not so near the river banks as that which has been cut.

CHENA RIVER ABOVE SHAMROCK CREEK.

This station was established July 1, 1912, about one-half mile above Shamrock Creek and about 600 feet above Van Curler's dam. A gage was set on each side of the creek at the same elevation so that the height might be read from either side of the stream at times of high water. The gage on the left bank was read at all times during low water. All measurements were made by wading. The water was confined to one channel at all stages below gage height 5.3. Above that level it occupied two channels. The measuring conditions were fairly good and the discharges as published should be excellent between 150 and 300 second-feet. The minimum discharge during the period covered by the records was 135 second-feet on July 12 and 13. The flow past the station during 1912 appears by comparison of records to have been considerably above the average, and the minimum flow was probably several times what should be expected for a minimum in low-water year. By comparing these records with those obtained on Chena River above Little Chena River during 1910–1912 a fair estimate could probably be made of the flow for those years at this station.

Discharge measurements of Chena River above Shamrock Creek in 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
July 1	5.30	195	Aug. 27	5.45	255
2	5.25	177	Sept. 3	5.31	196
Aug. 26	5.40	230			

Daily gage height, in feet, and discharge, in second-feet, of Chena River above Shamrock Creek for 1912.

[Drainage area, 157 square miles. Observer, A. Van Curler.]

Day.	July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	5.30	193	5.30	193	5.32	201	5.25	178
2	5.25	178	5.25	178	....	197	5.20	164
3	5.55	308	5.22	170	5.30	193	5.18	161
4	5.35	212	5.25	178	5.35	212	5.15	156
5	5.22	170	5.20	164	5.30	193	5.15	156
6	5.12	150	5.15	156	5.22	170	5.12	150
7	5.10	146	6.25	772	5.25	178	5.12	150
8	5.12	150	5.75	429	5.25	178	5.12	150
9	5.05	140	5.60	336	5.20	164	5.10	146
10	5.02	137	5.58	325	5.20	164	5.10	146
11	5.05	140	6.15	702	5.15	156	5.10	146
12	5.00	135	5.90	528	5.15	156	5.10	146
13	5.00	135	5.80	461	5.15	156	5.10	146
14	5.18	161	5.65	366	5.18	161	5.08	144
15	5.20	164	5.60	336	5.20	164	5.08	144
16	5.10	146	5.52	291	5.30	193	5.05	140
17	5.15	156	5.50	280	5.35	212	5.05	140
18	5.20	164	5.55	308	5.45	256	....	....
19	5.12	150	5.55	308	5.30	193	....	....
20	5.18	161	5.52	291	5.65	366	....	....
21	5.30	193	5.30	193	5.80	461	....	....
22	5.32	201	5.30	193	5.58	325	....	....
23	5.25	178	5.25	178	5.55	308	....	....
24	5.20	164	5.28	187	5.50	280	....	....
25	5.15	156	5.25	178	5.45	256	....	....
26	5.18	161	5.40	232	....	243	....	....
27	5.58	325	5.45	256	....	230	....	....
28	5.70	397	5.40	232	....	217	....	....
29	5.58	325	5.35	212	....	204	....	....
30	5.55	308	5.30	193	....	191	....	....
31	5.30	193	5.30	193	....	....	....	....
Mean discharge	....	190	....	291	....	219	....	151
Second-feet per square mile	....	1.21	....	1.85	....	1.39	....	0.961
Run-off (depth in inches on drainage basin)	....	1.40	....	2.13	....	1.55	....	0.61
Maximum	....	397	....	772	....	461	....	178
Minimum	....	135	....	156	....	156	....	140
Accuracy	....	B	....	C	....	B	....	A

CHENA RIVER ABOVE LITTLE CHENA RIVER.

This station was established May 17, 1910, on Chena River, about 5 miles above its union with Chena Slough and about 3 miles above the mouth of the Little Chena River. The gage was a vertical staff driven in a small dead slough about 100 feet from the main channel opposite A. G. Peterson's cabin. It was read morning and evening. All discharge measurements were made from a boat. The rating curves indicate that the relation between gage height and discharge was variable, probably owing largely to shifting channel, although the elevations of the gages as reset each season were determined by hand level and may be somewhat in error.

All 1911 records have been reduced to the 1910 datum and are directly comparable. The elevation of the zero of the 1912 gage was 0.67 foot lower than that of 1910, and the records for 1912 have not been adjusted to the 1910 datum.

Discharge measurements of Chena River above Little Chena River in 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
May 17	5.83	4,550	June 22	3.45	2,090	June 17	6.42	5,100
18	5.14	3,890	23	3.31	1,960	Aug. 3	2.39	1,020
June 26	1.54	1,050	July 5	4.07	2,750	4	2.36	1,020
Aug. 13	.38	569	6	4.24	2,900			
31	2.63	1,900						

Daily gage height, in feet, and discharge, in second-feet, of Chena River 5 miles above mouth of Little Chena River for 1910–1912.

[Drainage area, 1,440 square miles. Observer, A. G. Peterson.]

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.												
1			2.23	1,550	1.60	1,130	1.70	1,190	2.52	1,760	2.02	1,390
2			2.66	1,870	1.72	1,200	2.13	1,470	2.32	1,620	1.96	1,350
3			2.46	1,720	1.63	1,150	2.02	1,390	2.22	1,540	1.89	1,310
4			2 03	1,400	1.32	971	1.68	1,180	2.38	1,660	1.76	1,130
5			1.98	1,370	1.09	860	1.38	1,000	2.68	1,880	1.64	1,150
6			1.93	1,330	.98	811	1.23	925	3.25	2,340	1.59	1,120
7			2.56	1,800	1.35	988	1.06	847	4.05	3,000	1.38	1,000
8			2.23	1,550	1.37	998	.92	784	3.82	2,800	1.12	874
9			2.03	1,400	1.16	886	.83	747	3.26	2,350	.88	767
10			2.08	1,440	.95	798	.68	687	2.94	2,090	.86	759
11			8.98	7,190	.84	751	.58	648	2.68	1,880	.79	731
12			10.93	8,850	.74	711	.56	641	2.52	1,760	.71	699
13			9.23	7,400	.60	655	.38	578	2.38	1,660	.91	780
14			6.24	4,860	.60	655	.38	578	2.34	1,630	1.11	870
15			4.64	3,500	.44	599	.38	578	2.40	1,680	.99	816
16			3.64	2,650	.45	602	.38	578	3.55	2,580	.78	727
17	5.88	4,550	3.38	2,440	.46	606	.38	578	4.36	3,260	.66	679
18	5.09	3,880	2.90	2,060	.39	582	.48	613	4.36	3,260	.76	719
19	4.39	3,290	2.43	1,700	.28	544	2.29	1,590	4.38	3,280	.78	727
20	4.26	3,180	2.06	1,420	.26	538	6.05	4,700	3.95	2,910	.69	691
21	4.62	3,480	1.90	1,320	.19	518	5.64	4,350	3.28	2,360	.54	634
22	4.86	3,690	1.78	1,240	.10	495	4.84	3,670	2.89	2,050	.36	571
23	4.03	2,980	1.73	1,210	.10	495	3.62	2,640	2.78	1,960	.30	550
24	3.63	2,640	1.68	1,180	.32	557	3.24	2,330	2.70	1,900	.30	550
25	4.30	3,210	1.63	1,150	1.39	1,010	2.88	2,040	2.66	1,870	.30	550
26	4.79	3,630	1.54	1,090	2.02	1,390	3.05	2,180	2.50	1,750	.30	550
27	3.36	2,430	1.40	1,020	1.99	1,370	3.50	2,540	2.42	1,690	.30	550
28	2.38	1,660	1.45	1,040	1.72	1,200	3.19	2,290	2.32	1,620	.30	550
29	2.06	1,420	1.34	982	1.40	1,020	3.28	2,360	2.24	1,560		
30	1.98	1,370	1.21	915	1.23	925	2.95	2,100	2.10	1,450		
31	1.93	1,330			1.05	844	2.74	1,930				
Mean discharge		2,850		2,290		834		1,600		2,100		814
Second-feet per square mile		1.98		1.59		0.579		1.11		1.46		0.565
Run-off (depth in inches on drainage area)		1.10		1.77		0.67		1.28		1.63		0.59
Maximum		4,550		8,850		1,390		4,700		3,280		1,390
Minimum		1,330		915		495		578		1,450		550
Accuracy		A		A		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Chena River 5 miles above mouth of Little Chena River for 1910–1912—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1			2.18	1,220	0.78	529	2.16	1,210	2.35	1,340
2			2.78	1,640	.72	507	2.20	1,230	2.38	1,360
3			2.91	1,740	.62	472	2.50	1,440	2.22	1,240
4			2.85	1,690	.60	465	2.62	1,520	2.16	1,210
5			4.10	2,690	.60	465	2.50	1,440	2.06	1,150
6			3.80	2,450	.60	465	2.38	1,360	1.98	1,100
7			3.16	1,940	.60	465	2.28	1,290	1.82	1,000
8			3.28	2,030	.56	453	2.18	1,220	1.76	970
9			2.98	1,790	.55	450	2.08	1,160	1.60	883
10			2.69	1,570	.55	450	1.86	1,030	1.55	858
11			2.32	1,310	.55	450	1.82	1,000	1.45	808
12			2.15	1,200	1.02	619	1.74	958	1.40	783
13			2.02	1,120	2.60	1,510	1.84	1,020	1.34	755
14			1.92	1,060	2.45	1,400	1.90	1,050	1.36	764
15			1.85	1,020	2.58	1,500	1.90	1,050	1.26	718
16			1.75	964	6.35	4,550	1.82	1,000	1.26	718
17			1.58	873	8.20	6,120	1.86	1,030	1.10	650
18			1.46	812	7.60	5,610	1.72	947	1.06	634
19			1.40	783	7.30	5,360	1.70	936	1.06	634
20			1.28	727	6.10	4,340	1.65	910	1.00	611
21			1.20	691	5.01	3,420	1.60	883	.94	588
22	3.45	2,170	1.20	691	4.29	2,840	1.60	883	.89	569
23	3.26	2,020	1.16	675	3.76	2,420	1.58	873	.80	536
24	3.06	1,860	1.12	658	3.50	2,210	1.44	803	.80	536
25	2.88	1,720	1.06	634	3.00	1,810	1.48	822	.80	536
26	2.65	1,540	1.00	611	2.78	1,640	1.78	981	.74	514
27	2.48	1,430	.94	588	2.58	1,500	1.85	1,020	.76	522
28	2.32	1,310	.90	573	2.46	1,410	2.05	1,140	.70	500
29	2.18	1,220	.90	573	2.46	1,410	2.26	1,270	.70	500
30	2.00	1,110	.88	566	2.38	1,360	2.40	1,370		
31			.85	554	2.26	1,270				
Mean discharge		1,600		1,140		1,850		1,090		793
Second-feet per square mile		1.11		0.792		1.29		0.757		0.551
Run-off (depth in inches on drainage area)		0.37		0.91		1.49		0.84		0.59
Maximum		2,170		2,690		6,120		1,520		1,360
Minimum		1,110		554		450		803		500
Accuracy		B		C		D		D		D

Daily gage height, in feet, and discharge, in second feet, of Chena River 5 miles above mouth of Little Chena River for 1910–1912—Continued.

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
1912.						
1	......	......	4.35	2,500	2.66	1,200
2	......	......	3.89	2,130	2.48	1,090
3	......	......	3.64	1,930	2.40	1,040
4	......	......	......	1,860	2.36	1,020
5	......	......	3.45	1,780	2.24	944
6	......	......	3.32	1,680	2.16	896
7	......	......	2.99	1,430	2.11	866
8	......	......	2.78	1,290	2.09	855
9	......	......	2.62	1,170	2.58	1,150
10	......	......	2.48	1,090	2.78	1,290
11	......	......	2.40	1,040	2.60	1,160
12	......	......	2.34	1,000	2.52	1,110
13	......	......	2.29	974	2.60	1,160
14	......	......	2.24	944	......	......
15	......	......	2.19	914	......	......
16	......	......	2.28	968	......	......
17	6.62	5,270	2.38	1,030	......	......
18	6.90	5,500	2.28	968	......	......
19	5.18	4,030	2.20	920	......	......
20	7.22	5,780	2.32	992	......	......
1912—Con.						
21	7.69	6,180	2.30	980	......	......
22	5.76	4,530	2.30	980	......	......
23	5.24	4,080	2.46	1,080	......	......
24	8.52	6,900	2.46	1,080	......	......
25	11.05	9,050	2.44	1,060	......	......
26	10.95	8,920	2.28	968	......	......
27	8.75	7,100	2.22	932	......	......
28	7.40	5,930	2.12	872	......	......
29	5.50	3,440	2.38	1,030	......	......
30	4.82	2,880	2.50	1,100	......	......
31	......	......	2.82	1,310	......	......
Mean discharge	......	5,690	......	1,230	......	1,060
Second-feet per square mile	......	0.395	......	0.854	......	0.736
Run-off (depth in inches on drainage area)	......	0.21	......	0.98	......	0.36
Maximum	......	9,050	......	2,500	......	1,290
Minimum	......	2,880	......	872	......	855
Accuracy	......	D	......	C	......	B

NORTH FORK OF CHENA RIVER ABOVE MONUMENT CREEK.

A gage was installed on the left bank of North Fork of Chena River about 150 feet above the mouth of Monument Creek on June 28, 1912. A good measuring section was not available, but sufficient measurements were obtained to give a well-defined discharge curve for all stages above 40 second-feet.

The discharges at this station for 1912 were no doubt considerably above the normal.

Discharge measurements of North Fork of Chena River above Monument Creek in 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 28	2.82	116	July 21	2.48	46
29	2.75	96	Aug. 29	2.57	63
July 20	2.46	45			

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Chena River above Monument Creek for 1912.

[Drainage area, 93.8 square miles. Observers, D. H. Luckey and Theodore Rolston.]

Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.54	56	2.42	40
2			2.50	50	2.39	37
3			2.50	50	2.37	36
4			2.46	45	2.37	36
5			2.42	40	2.35	34
6			2.37	36	2.35	34
7			2.35	34	2.54	56
8			2.35	34	2.44	43
9			2.33	33	2.46	45
10			2.33	33	2.46	45
11			2.37	36	2.50	50
12			2.35	34	2.58	63
13			2.33	33	2.67	81
14			2.37	36	2.58	63
15			2.46	45	2.58	63
16			2.42	40	2.54	56
17			2.44	43		
18			2.42	40		
19			2.44	43		
20			2.44	43		

Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
21			2.48	48		
22			2.44	43		
23			2.42	40		
24			2.29	30		
25			2.37	36		
26			2.37	36		
27			2.42	40		
28	2.83	119	2.60	66		
29	2.75	99	2.58	63		
30	2.62	70	2.50	50		
31			2.44	43		
Mean discharge				41.9		48.9
Second-feet per square mile				0.447		0.521
Run-off (depth in inches on drainage area)				0.52		0.31
Maximum				66		81
Minimum				30		34
Accuracy				A		A

NORTH FORK OF CHENA RIVER BELOW MONUMENT CREEK.

This station was established June 28, 1912. The gage was located about 500 feet below the mouth of Monument Creek. The rating curve is very poorly defined and the discharges are only approximate. The discharges at this station for 1912 were no doubt considerably above the normal.

Discharge measurements of North Fork of Chena River below Monument Creek in 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 28	4.08	162	July 21	3.71	87
29	4.00	140	Aug. 29	3.73	90
July 20	3.67	75	30	3.71	84

Daily gage height, in feet, and discharge, in second-feet, of North Fork of Chena River below Monument Creek for 1912.

[Drainage area, 129 square miles. Observers, D. H. Luckey and Theodore Rolston.]

Day.	June.		July.		August.		Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.79	98	3.67	78	21			3.71	84		
2			3.75	90	3.60	67	22			3.67	78		
3			3.73	87	3.58	64	23			3.62	70		
4			3.69	80	3.58	64	24			3.58	64		
5			3.64	73	3.60	67	25			3.56	61		
6			3.60	67	3.54	59	26			3.58	64		
7			3.58	64	3.35	124	27			3.79	98		
8			3.48	50	3.21	92	28	4.08	161	3.96	133		
9			3.54	59	3.54	103	29	4.00	142	3.83	106		
10			3.52	56	3.29	83	30	3.87	114	3.73	87		
11			3.48	50	3.83	106	31			3.69	80		
12			3.54	59	3.75	90	Mean discharge				75.9		85.9
13			3.52	56	3.83	106	Second-feet per square mile				0.588		0.666
14			3.58	64	3.79	98	Run-off (depth in inches on drainage area)				0.68		0.40
15			3.67	78	3.75	90	Maximum				133		124
16			3.62	70	3.71	84	Minimum				50		59
17			3.67	78			Accuracy				D		D
18			3.73	87									
19			3.71	84									
20			3.67	78									

NOTE.—Discharges from Aug. 7–10 applied indirectly.

MONUMENT CREEK AT CHENA HOT SPRINGS.

A gage was installed on Monument Creek June 28, 1912, about 1½ miles above the mouth of the creek and directly opposite Chena Hot Springs. The rating curve was well defined between 20 and 50 second-feet. The channel appeared to be fairly permanent and the measuring conditions were good. The flow past this station for 1912 was no doubt considerably above the average.

Discharge measurements of Monument Creek at Chena Hot Springs in 1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 28	2.54	50	Aug. 29	2.26	24
29	2.46	39	31	2.24	22
July 20	2.27	26			

Daily gage height, in feet, and discharge, in second-feet, of Monument Creek at Chena Hot Springs for 1912.

[Drainage area, 30.1 square miles. Observers, D. H. Luckey and Theodore Rolston.]

Day.	June.		July.		August.		Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.33	29	2.27	25	21			2.29	26		
2			2.31	28	2.25	24	22			2.29	26		
3			2.29	26	2.25	24	23			2.25	24		
4			2.25	24	2.25	24	24			2.29	26		
5			2.23	23	2.25	24	25			2.19	21		
6			2.21	22	2.25	24	26			2.23	23		
7			2.17	20	2.67	63	27			2.67	63		
8			2.19	21	2.50	44	28	2.54	48	2.75	74		
9			2.17	20	2.58	53	29	2.44	39	2.50	44		
10			2.17	20	2.37	33	30	2.37	33	2.33	29		
11			2.19	21	2.50	44	31			2.29	26		
12			2.17	20	2.58	53							
13			2.17	20	2.42	37	Mean discharge				28.0		37.4
14			2.27	25	2.62	57							
15			2.31	28	2.37	33							
16			2.25	24	2.42	37	Second-feet per square mile				.930		1.24
17			2.33	29									
18			2.35	31									
19			2.33	29									
20			2.27	25			Run-off (depth in inches on drainage area)				1.07		0.74
							Maximum				74		63
							Minimum				20		24
							Accuracy				A		A

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in Chena River drainage basin in 1912:

Miscellaneous measurements in Chena River drainage basin in 1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	Sq. mi.	Sec.-ft.
July 19	North Fork of Chena River.	Chena River	Below Boulder Creek.	24	49.6	0.48
July 22	Frozenfoot Creek	West Fork of Chena River.	Elevation 1,500 feet	7.9	21	.38
22	do	do	2 miles above mouth	14	40.8	.34
22	West Fork of Chena River.	Chena River	Above Olympia Creek.	32	106	.30
22	Olympia Creek	West Fork of Chena River.	Mouth	22	23.6	.93

LITTLE CHENA RIVER DRAINAGE BASIN.

DESCRIPTION.

The southern slope of the divide between the Chatanika and Chena drainage basins, from the headwaters of Smith and Flat creeks to Pedro Dome, a distance of about 25 miles, is drained by Little Chena

River and its tributaries, Sorrels and Fish creeks. The drainage basin is irregular in shape and is crossed by a network of small, ramifying streams with precipitous slopes in their upper courses. The upper portion of the main stream is also steep, having a fall of 100 to 150 feet to the mile, but this slope decreases rather abruptly to about 18 feet to the mile in the vicinity of Sorrels and Fish creeks.

Above Fish Creek the Little Chena flows through a rather broad, asymmetric valley, but below that stream it takes the center of a deep, rather narrow channel for about 8 miles, to Anaconda Creek, an important tributary which enters from the left. Below this point the valley gradually widens again until the stream reaches the lowlands tributary to Chena River, with which it unites 3 or 4 miles above the confluence of Chena Slough. Through this slough the Chena discharges its waters into the Tanana near the town of Chena. The slough affords a passageway for the Tanana steamers from its mouth to Fairbanks, 12 miles above, except in times of low water, when the cargoes are transferred at Chena to the Tanana Valley Railroad.

In the low-water period the stream occupies a channel 30 to 75 feet wide, crossing from side to side of a broad, gravelly bed ranging in width from 100 to 300 feet. The channel is defined by steep, alluvial banks that form the approach to the heavily timbered bottom lands which prevail in the river valley above the confluence of Fish Creek. At high-water stages the river completely fills its broad bed, overflowing the banks and seeking numerous smaller channels that surround heavily wooded islands.

Solo, Bear, Fairbanks, and Miller creeks are the principal tributaries, named in downstream order, of Fish Creek. All of them enter from the left. Elliott Creek rises opposite Kokomo Creek, flows southeast for about 6 miles, and enters Sorrels Creek about 2 miles above the Little Chena.

The greater part of the drainage basin is well covered with timber, that in the uplands and on the slopes and smaller divides consisting of spruce, birch, and poplar, suitable only for fuel and cabin building. In the lower valleys and creek bottom lands the prevailing growth is spruce, much of which is suitable for milling purposes.

The area is everywhere covered with the common moss, but here and there limestones, mica schist, and gravel outcrop on the slopes. In the creek valleys the mossy covering is usually underlain with frozen muck and glacial ice.

LITTLE CHENA RIVER ABOVE SORRELS CREEK.

This station was established July 22, 1907, about 2 miles above Sorrels Creek and about one-half mile below Bonanza Creek. Records of gage heights were kept during part of the summers of 1907 and 1908. On July 3, 1910, a gage was installed on the creek near the location of the original gage but not at the same section. The rating curves for the two gages are, therefore, not comparable. The drainage areas are essentially the same.

Gage heights for 1907 and 1908 were obtained in cooperation with Messrs. Joslin, Wobber, and others.

Discharge measurements of Little Chena River above Sorrels Creek in 1907, 1908, and 1910.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
1907.				1910.			
July 22	C. C. Covert	0.60	44	July 3	G. L. Parker	1.70	30
24	Covert and White	.56	40	10	T. J. Shaw	1.68	24
Aug. 4	.....do	1.10	113	17	.....do	1.65	19.7
5	.....do	1.05	103	24	.....do	2.40	163
20	C. C. Covert	.73	57	Aug. 1	.....do	1.85	50
				8	Parker and Shaw	1.69	24
1908.				20	T. J. Shaw	2.48	194
May 29	Covert and White	1.65	249	22	.....do	2.13	100
July 21	C. C. Covert	.46	32	24	Parker and Shaw	2.04	77
31	Geo. Neuner, jr	.46	34				

Daily gage height, in feet, and discharge, in second-feet, of Little Chena River above Sorrels Creek for 1907, 1908, and 1910.

[Drainage area, 79 square miles. Observers: Sherman White, 1907–8; T. J. Shaw, 1910.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1907.						
1			0.70	53	1.00	95
2			1.30	157	.90	80
3			1.10	113	.90	80
4			1.10	113	.80	66
5			1.10	113	.90	80
6			1.00	95	.95	88
7			1.05	104	.95	88
8			1.10	113	1.00	95
9			1.20	134		95
10			1.10	113	1.00	95
11			1.00	95		
12			.90	80		
13			1.00	95		
14			.80	66		
15			.90	80		
16			.80	66		
17				66		
18				60		
19				60		
20			.70	53		
21			.70	53		
22	0.60	42	.70	53		
23		42	.70	53		
24	.60	42	.70	53		
25	.60	42		73		
1907—Con.						
26	0.90	80	1.00	95		
27	.80	66	.90	80		
28	.70	53	.90	80		
29	.60	42		88		
30	.60	42	1.00	95		
31	.60	42	1.00	95		
Mean discharge		49.3		85.4		86.2
Second-feet per square mile		0.625		1.08		1.09
Run-off (depth in inches on drainage area)		0.23		1.24		0.40
Maximum		80		157		95
Minimum		42		53		66
Accuracy		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Little Chena River above Sorrels Creek for 1907, 1908, and 1910—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1				210				32
2				197				32
3			1.40	185				32
4				160				29
5				185				29
6			1.55	223				29
7				185			0.41	29
8				172			.50	35
9				160				35
10			1.25	148				32
11				160			.40	28
12				172				30
13				172				30
14				197			.45	32
15			1.45	197				35
16				160				38
17			1.20	136				42
18				148				46
19			1.10	113			.70	52
20	2.20	405						58
21		374			0.46	33		65
22		374				33	.90	79
23		346				33	.80	65
24		318				33		58
25		290				33		52
26		263				33	.65	46
27		236				33		
28		210				33		
29	1.60	236				33		
30		250				33		
31		250			.46	33		
Mean discharge		296		173		33.0		41.1
Second-feet per square mile		3.75		2.19		0.418		0.520
Run-off (depth in inches on drainage area)		1.67		1.55		0.17		0.49
Maximum		405		223		33		79
Minimum		210		113		33		28
Accuracy		B		A		A		

NOTE.—Discharges on days of missing gage heights were estimated by comparison with discharges at other stations in the Little Chena basin.

Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.
1910.				
1		27	1.85	47
2		27	1.78	37
3	1.70	27		34
4		27	1.74	32
5		27	1.73	31
6	1.70	27	1.71	28
7	1.69	26	1.70	27
8	1.68	25	1.69	26
9	1.68	25	1.68	25
10	1.68	25	1.68	25
11	1.67	24	1.67	24
12	1.67	24	1.67	24
13	1.68	25	1.66	23
14	1.67	24	1.65	22
15	1.66	23	1.65	22
16	1.65	22	1.67	24
17	1.65	22	1.70	27
18	1.65	22	2.93	350
19	1.66	23		272
20	1.65	22	2.49	194
1910—Con.				
21	1.66	23	2.25	126
22	1.75	33	2.13	98
23	2.09	89	2.04	80
24	2.40	166	2.05	82
25	2.07	85		100
26	1.90	55	2.22	118
27	1.81	41	2.15	102
28	1.78	37	2.10	91
29	1.74	32	2.03	78
30	1.78	37	2.00	72
31	1.90	55		70
Mean discharge		37.0		74.5
Second-feet per square mile		0.468		0.943
Run-off (depth in inches on drainage area)		0.54		1.09
Maximum		166		350
Minimum		22		22
Accuracy		A		A

NOTE.—Discharge curve well defined below 250 second-feet.

LITTLE CHENA RIVER BELOW FISH CREEK.

This station was established May 1, 1908, discontinued August 27, 1908, and reestablished July 2, 1910. The gage was located on the right bank of Little Chena River about 250 feet below the mouth of Fish Creek. Measurements were made from a car and cable at high water and by wading at low and medium water.

The difference in elevation between the 1908 and 1910 gages is not known, so the records are not directly comparable. The discharge rating curves for each year are fairly well defined.

Gage heights for 1908 were obtained in cooperation with Messrs. Joslin, Wobber, and others.

Discharge measurements of Little Chena River below Fish Creek in 1908, 1910–11.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1908.		*Feet.*	*Sec.-ft.*	1910.		*Feet.*	*Sec.-ft.*
Apr. 28	Covert and White	(a)	126	May 22	Ellsworth and Parker	2.96	473
May 2	.....do	b 3.75	916	July 4	Parker and Shaw	.99	58
3	.....do	4.00	887	Aug. 7	.....do	.84	44
4	.....do	4.00	960	14	T. J. Shaw	.74	36
5	.....do	4.08	1,030	23	Parker and Shaw	1.54	141
July 20	Covert and Ellsworth	1.60	83				
21	C. E. Ellsworth	1.50	74	1911.			
30	Geo. Neuner, jr	1.50	75	Aug. 6	C. E. Ellsworth	.71	32
Aug. 3	.....do	1.58	88				
23	C. C. Covert	1.80	110				

a Measurement made before gage was installed, river partly filled with ice.
b Some ice running.

Daily gage height, in feet, and discharge, in second-feet, of Little Chena River below Fish Creek for 1908 and 1910.

[Drainage area, 228 square miles. Observers, Sherman White and T. J. Shaw, 1910.]

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1	3.65	714	3.35	537	....	....	1.48	68
2	3.70	746	2.95	367	....	....	1.56	78
3	4.00	960	2.65	274	....	....	1.58	80
4	4.00	960	2.48	231	....	....	1.54	74
5	4.05	998	3.48	608	....	....	1.49	68
6	4.15	1,075	3.55	651	....	....	1.44	62
7	3.90	885	3.00	384	....	....	1.45	64
8	3.71	753	2.80	318	....	....	1.50	70
9	3.68	732	2.48	230	....	....	1.50	70
10	3.70	746	2.31	192	....	....	1.49	68
11	....	732	2.40	212	....	....	1.45	64
12	3.65	714	2.60	260	....	....	1.40	59
13	3.68	732	2.55	248	....	....	1.40	59
14	3.70	746	2.68	282	....	....	1.46	65
15	3.98	940	2.98	378	....	....	1.49	68
16	4.85	1,668	2.58	256	....	....	1.52	72
17	4.68	1,510	2.50	235	....	....	1.62	84
18	4.38	1,265	2.70	288	....	....	1.60	82
19	4.38	1,265	2.45	224	....	....	1.65	88
20	4.44	1,320	2.40	212	1.60	82	1.70	95
21	4.38	1,265	....	....	1.50	70	1.82	111
22	3.88	870	....	....	....	70	1.90	122
23	3.50	620	....	....	....	70	1.75	101
24	3.52	632	....	....	....	70	1.72	98
25	3.20	465	....	....	....	70	1.70	95
26	2.82	324	....	....	....	70	1.64	86
27	2.62	265	....	....	....	70	1.65	88
28	3.25	489	....	....	....	70	....	....
29	3.15	443	....	....	1.50	70	....	....
30	3.15	443	....	....	1.50	70	....	....
31	3.30	512	....	....	1.45	64	....	....
Mean discharge	....	832	....	319	....	70.5	....	79.2
Second-feet per square mile	....	3.65	....	1.40	....	0.309	....	0.347
Run-off (depth in inches on drainage area)	....	4.21	....	1.04	....	0.14	....	0.35
Maximum	....	1,668	....	651	....	82	....	122
Minimum	....	265	....	192	....	64	....	59
Accuracy	....	C	....	B	....	A	....	A

Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.
1910.				
1	....	75	1.16	80
2	1.08	70	1.06	67
3	1.04	65	.98	58
4	1.00	60	.96	56
5	.98	58	.92	51
6	.96	56	.89	48
7	.94	53	.86	45
8	.91	50	.84	44
9	.88	47	.84	44
10	.89	48	.82	42
11	.89	48	.80	40
12	.89	48	.78	39
13	.89	48	.76	38
14	.88	47	.74	36
15	.84	44	.75	37
16	.80	40	.78	39
17	.76	38	.91	50
18	.76	38	1.86	194
19	.81	41	2.92	460
20	.80	40	2.18	256
1910—Con.				
21	0.84	44	1.86	194
22	1.03	64	1.68	162
23	1.37	111	1.56	142
24	2.06	232	1.56	142
25	1.58	145	1.74	172
26	1.35	108	1.76	176
27	1.20	85	1.68	162
28	1.08	70	1.58	145
29	.99	59	1.50	132
30	1.03	64	1.44	122
31	1.24	91	....	110
Mean discharge	....	67.3	....	109
Second-feet per square mile	....	0.295	....	0.478
Run-off (depth in inches on drainage area)	....	0.34	....	0.55
Maximum	....	232	....	460
Minimum	....	38	....	36
Accuracy	....	A	....	A

SORRELS CREEK ABOVE ELLIOTT CREEK.

This station was established July 23, 1907, about one-half mile above the mouth of Elliott Creek. It was discontinued August 26, 1908, and reestablished July 3, 1910. The conditions at the station were favorable for accuracy and the results, particularly the records for 1910, should be excellent.

Gage heights for 1907 and 1908 were obtained in cooperation with Messrs. Joslin, Wobber, and others.

Discharge measurements of Sorrels Creek above Elliott Creek in 1907, 1908, and 1910.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1907.		*Feet.*	*Sec.-ft.*	1910.		*Feet.*	*Sec.-ft.*
July 3	Covert and White	1.00	10.3	July 3	Parker and Shaw	1.33	4.9
Aug. 5	do	1.40	28	10	T. J. Shaw	1.32	4.7
20	C. C. Covert	1.02	12.0	17	do	1.26	3.6
				24	do	2.03	43
1908.				31	do	1.46	9.4
May 29	Covert and White	1.75	54	Aug. 8	Parker and Shaw	1.30	4.2
July 21	C. C. Covert	1.09	11.3	18	T. J. Shaw	1.75	25
31	Geo. Neuner, jr	1.03	10.5	20	do	1.92	38
				24	Parker and Shaw	1.66	17.4

Daily gage height, in feet, and discharge, in second-feet, of Sorrels Creek above Elliott Creek for 1907, 1908, and 1910.

[Drainage area, 21 square miles. Observers, Sherman White and T. J. Shaw, 1910.]

Day.	July.		August.		September.		Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1907.							1907—Con.						
1			1.1	13	1.2	17	21			1.0	10		
2			1.4	28	1.2	17	22		10	1.0	10		
3			1.4	28	1.1	13	23	1.0	10	1.0	10		
4			1.5	34	1.1	13	24	1.0	10	1.0	10		
5			1.35	26	1.1	13	25	1.0	10		12		
6			1.3	22		13	26	1.1	13	1.1	13		
7				22		13	27	1.1	13	1.1	13		
8			1.3	22	1.1	13	28	1.0	10	1.2	17		
9			1.4	28			29	1.0	10		17		
10			1.3	22			30		8		17		
							31	.9	7.5	1.2	17		
11			1.3	22									
12			1.2	17									
13			1.2	17			Mean discharge		10.2		17.3		14.0
14			1.2	17									
15			1.1	13									
16			1.1	13			Second-feet per square mile		0.486		0.824		0.667
17				12									
18				12									
19				11									
20			1.0	10			Run-off (depth in inches on drainage area)		0.18		0.95		0.20
							Maximum		13		34		17
							Minimum		7.5		10		13
							Accuracy		B		B		B

Daily gage height, in feet, and discharge, in second-feet, of Sorrels Creek above Elliott Creek for 1907, 1908, and 1910—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1				66				11
2				50				11
3			1.55	36				10
4				34				10
5				28				10
6			1.45	30				10
7				30			1.00	10
8				29			1.02	10
9				28				10
10			1.40	27				10
11				29			.99	10
12				31				10
13				39				10
14				37			1.01	10
15			1.60	40				11
16				42				13
17			1.65	45				15
18				50				15
19			1.65	45			1.15	15
20	2.30	131						16
21		113			1.08	12		17
22		98				12	1.22	18
23		84				11		17
24		72				11		17
25		60				11		15
26		50				11	1.10	13
27		36				11		
28		45				11		
29	1.75	55				11		
30		66				11		
31		66			1.03	11		
Mean discharge		73.0		37.7		11.2		12.5
Second-feet per square mile		3.48		1.80		0.533		0.595
Run-off (depth in inches on drainage area)		1.55		1.27		0.22		0.58
Maximum		131		66		12		18
Minimum		36		27		11		10
Accuracy		C		B		B		B

NOTE.—Discharge curve for 1907 and 1908 fairly well defined for all stages below 70 second-feet.

Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.
1910.				
1		5.2	1.43	7.9
2		5.1	1.40	6.8
3	1.33	5.0		6.2
4		4.9	1.35	5.5
5		4.8	1.34	5.2
6	1.32	4.7	1.33	5.0
7	1.30	4.2	1.31	4.5
8	1.30	4.2	1.38	4.2
9	1.32	4.7	1.30	4.2
10	1.32	4.7	1.30	4.2
11	1.31	4.5	1.29	4.0
12	1.31	4.5	1.28	3.9
13	1.31	4.5	1.26	3.6
14	1.30	4.2	1.26	3.6
15	1.30	4.2	1.26	3.6
16	1.27	3.7	1.28	3.9
17	1.26	3.6	1.33	5.0
18	1.26	3.6	1.78	27
19	1.29	4.0		32
20	1.27	3.7	1.92	36
1910—Con.				
21	1.30	4.2	1.29	27
22	1.40	6.8	1.68	19.8
23	1.58	14.1	1.60	15.0
24	2.05	46	1.66	18.6
25	1.70	21		21
26	1.55	12.7	1.74	24
27	1.49	10.0	1.69	20
28	1.43	7.9	1.64	17.4
29	1.40	6.8	1.60	15.0
30	1.40	6.8	1.55	12.7
31	1.46	9.1		12.0
Mean discharge		7.53		12.2
Second-feet per square mile		0.359		0.581
Run-off (depth in inches on drainage area)		0.41		0.67
Maximum		46		36
Minimum		3.6		3.6
Accuracy		A		A

NOTE.—Discharge curve well defined for all stages.

ELLIOTT CREEK NEAR MOUTH.

This station was established July 23, 1907, about half a mile above Sorrels Creek. Daily gage heights were obtained during a part of the open seasons of 1907 and 1908. No records were obtained in 1909. The station was reestablished on July 3, 1910, and daily records were kept until August 30, 1910. The discharge rating curves for 1907 and 1908 are not very well defined and the estimates for those years are liable to considerable error. The discharge curve for 1910 is well defined for all stages and the record should be excellent. The gage was located at the same section each season but not at the same elevation. The measurements are not directly comparable and a different rating curve was used each year. Gage heights for 1907 and 1908 were obtained in cooperation with Messrs. Joslin, Wobber, and others.

Discharge measurements of Elliott Creek near mouth in 1907, 1908, and 1910.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1907.		*Feet.*	*Sec.-ft.*	1910.		*Feet.*	*Sec.-ft.*
July 23	Covert and White......	1.60	5.1	July 3	Parker and Shaw......	1.53	2.9
Aug. 5	.....do....................	1.85	13.8	10	T. J. Shaw.............	1.53	3.0
20	C. C. Covert...........	1.62	7.1	17	.....do.................	1.49	2.4
				24	.....do.................	1.89	10.5
1908.				31	.....do.................	1.60	4.6
May 29	Covert and White......	2.15	32	Aug. 8	Parker and Shaw......	1.48	2.5
July 21	C. C. Covert...........	1.35	4.4	18	T. J. Shaw.............	2.05	14.9
31	Geo. Neuner, jr........	1.35	4.5	23	.....do.................	1.73	6.8
				24	Parker and Shaw......	1.82	8.7

Daily gage height, in feet, and discharge, in second-feet, of Elliott Creek near mouth for 1907, 1908, and 1910.

[Drainage area, 13.8 square miles. Observers: Sherman White, 1907-8; T. J. Shaw, 1910.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1907.						
1	......	......	1.7	8.3	1.8	11.8
2	......	......	2.1	26	1.8	11.8
3	......	......	2.1	26	1.7	8.3
4	......	......	......	19.0	1.7	8.3
5	......	......	1.8	11.8	1.7	8.3
6	......	......	1.8	11.8	......	8.3
7	......	......	......	11.8	......	8.3
8	......	......	1.8	11.8	1.7	8.3
9	......	......	1.9	16.0	......	......
10	......	......	1.8	11.8	......	......
11	......	......	1.8	11.8	......	......
12	......	......	1.7	8.3	......	......
13	......	......	1.8	11.8	......	......
14	......	......	1.8	11.8	......	......
15	......	......	1.7	8.3	......	......
16	......	......	1.7	8.3	......	......
17	......	......	......	7.8	......	......
18	......	......	......	7.4	......	......
19	......	......	1.65	7.0	......	......
20	......	......	1.6	5.8	......	......

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1907—Con.						
21	......	......	1.6	5.8	......	......
22	......	......	1.6	5.8	......	......
23	1.6	5.8	1.6	5.8	......	......
24	1.6	5.8	1.6	5.8	......	......
25	1.6	5.8	......	7.0	......	......
26	1.7	8.3	1.7	8.3	......	......
27	1.7	8.3	1.7	8.3	......	......
28	1.6	5.8	1.8	11.8	......	......
29	1.6	5.8	......	11.8	......	......
30	......	4.8	......	11.8	......	......
31	1.5	3.8	1.8	11.8	......	......
Mean discharge	......	6.02	......	10.9	......	9.18
Second-feet per square mile	......	0.436	......	0.790	......	0.665
Run-off (depth in inches on drainage area)	......	0.15	......	0.91	......	0.20
Maximum	......	8.3	......	26	......	11.8
Minimum	......	3.8	......	5.8	......	8.3
Accuracy	......	C	......	C	......	C

Daily gage height, in feet, and discharge, in second-feet, of Elliott Creek near mouth for 1907, 1908, and 1910—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1				50				4.4
2				22				4.3
3			1.85	17.3				4.2
4				17				4.1
5				16				4.0
6			1.80	15.3				3.9
7				17			1.30	3.8
8				19			1.33	4.3
9				21				4.1
10			2.15	32				3.9
11				30			1.29	3.7
12				28				4.0
13				26				4.0
14				24			1.34	4.4
15			2.00	24				4.5
16				15				4.5
17			1.75	13.6				4.5
18				13				4.5
19			1.73	13.0			1.35	4.6
20	3.30	111						4.8
21		80			1.35	4.6		5.0
22		50				4.6	1.40	5.2
23		40				4.6		5.0
24		30				4.6		4.8
25		20				4.6		4.6
26		11				4.6	1.34	4.4
27		15				4.6		
28		22				4.6		
29	2.15	32				4.6		
30		48				4.6		
31		48			1.35	4.6		
Mean discharge		42.2		22.8		4.60		4.37
Second-feet per square mile		3.06		1.65		0.333		0.317
Run-off (depth in inches on drainage area)		1.36		1.16		0.14		0.31
Maximum		*111*		50		4.6		5.2
Minimum		11		13		4.6		3.7
Accuracy		D		C		B		B

Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.
1910.				
1		3.0	1.57	3.9
2		3.0	1.55	3.6
3	1.53	3.0		3.4
4		2.9	1.52	3.1
5		2.9	1.51	3.0
6	1.52	2.8	1.50	2.8
7	1.51	2.6	1.49	2.9
8	1.51	2.6	1.48	2.6
9	1.51	2.6	1.48	2.6
10	1.52	2.8	1.48	2.6
11	1.51	2.6	1.47	2.4
12	1.53	3.0	1.46	2.3
13	1.52	2.8	1.46	2.3
14	1.51	2.6	1.46	2.3
15	1.51	2.6	1.46	2.3
16	1.50	2.5	1.48	2.6
17	1.49	2.4	1.56	3.8
18	1.48	2.3	2.04	14.6
19	1.50	2.5		14.8
20	1.49	2.4	2.06	15.1
1910—Con.				
21	1.53	3.3	1.90	10.8
22	1.59	4.2	1.80	8.4
23	1.66	5.5	1.73	6.9
24	1.89	10.6	1.82	8.9
25	1.71	6.5		8.4
26	1.64	5.2	1.77	7.8
27	1.59	4.2	1.74	7.1
28	1.55	3.6	1.71	6.5
29	1.54	3.4	1.67	5.7
30	1.55	3.6	1.64	5.2
31	1.60	4.4		5.0
Mean discharge		3.50		5.60
Second-feet per square mile		0.254		0.405
Run-off (depth in inches on drainage area)		0.29		0.47
Maximum		10.6		15.1
Minimum		2.3		2.3
Accuracy		A		A

NOTE.—Two rating curves were used for 1910; the first applicable from July 3 to 20, the second from July 21 to Aug. 30.

FISH CREEK BELOW SOLO CREEK.

This station was established June 14, 1910, about 100 feet below the mouth of Solo Creek. The channel was fairly permanent except that some silt was deposited during low water which was removed by the first high water. The gage was at a different elevation each season, due to the rising action of ice and frost, but the changes were not accurately determined.

The station was installed principally to take the place of the one on Fish Creek above Fairbanks Creek, which was abandoned in 1908. The drainage area of Fish Creek above this station is 55 per cent of the drainage area of Fish Creek above Fairbanks Creek.

Discharge measurements of Fish Creek below Solo Creek in 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 14	2.06	22	June 20	1.90	18.8	June 12	2.34	27
July 7	1.31	6.2	July 2	2.28	28	July 30	1.64	12.5
Aug. 9	1.38	5.2	Aug. 6	1.16	4.8	Aug. 6	1.54	9.7
22	1.95	14.4						

Daily gage height, in feet, and discharge, in second-feet, of Fish Creek below Solo Creek for 1910–1912.

[Drainage area, 21.5 square miles. Observer, William Hugel.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.										
1			1.40	7.1	1.50	7.0	1.90	13.3	1.70	9.2
2				7.0	1.45	6.4	2.00	15.7	1.70	9.2
3				7.0	1.45	5.9	1.90	13.3		
4				6.9	1.40	5.5	2.45	28		
5				6.8	1.35	5.1	2.70	35		
6				6.7	1.35	5.1	2.25	22		
7			1.35	6.3	1.35	5.1	1.90	13.3		
8			1.38	6.7	1.40	5.5	1.85	12.2		
9			1.33	6.1	1.38	5.2	1.85	12.2		
10			1.33	6.1	1.35	5.0	1.70	9.2		
11			1.33	6.1	1.35	5.0		9.1		
12			1.38	6.7	1.30	4.8		9.0		
13			1.36	6.3	1.35	5.0		9.0		
14	2.05	22	1.36	6.1	1.30	4.8		26		
15	1.90	17.5	1.31	5.7	1.35	5.0	3.00	44		
16	1.90	17.5	1.26	5.4	1.40	5.3	3.10	47		
17	1.90	17.5	1.31	5.7	1.90	13.3	3.20	50		
18	1.85	16.2	1.31	5.7	2.80	38	3.20	50		
19	1.55	9.5	1.39	6.4	2.80	38	2.70	35		
20	1.50	8.6	1.34	5.9	2.45	28	2.30	23		
21	1.60	10.4	1.64	10.0	2.40	26	2.20	21		
22	1.55	9.5	1.69	11.0	2.00	15.7	2.10	18.2		
23	1.55	9.5	1.74	12.0	1.90	13.3	1.95	14.5		
24	1.40	7.1	2.02	18.7	2.10	18.2	1.95	14.5		
25	1.40	7.1	2.07	20	2.30	23	1.95	14.5		
26	1.40	7.1	1.82	13.9	2.30	23	1.90	13.3		
27	1.50	8.6	1.82	13.9	2.00	15.7	1.80	11.2		
28	1.80	15.0	1.67	9.8	1.85	12.2	1.80	11.2		
29	1.60	10.4	1.62	8.9	1.85	12.2	1.75	10.2		
30	1.60	10.4	1.63	9.1	1.80	11.2	1.70	9.2		
31			1.60	8.5	1.70	9.2				
Mean discharge		12.0		8.47		12.3		20.5		
Second-feet per square mile		0.558		0.394		0.572		0.953		
Run-off (depth in inches on drainage basin)		0.35		0.45		0.66		1.06		
Maximum		22		20		38		50		
Minimum		7.1		5.4		4.8		9.0		
Accuracy		C		C		C		C		

NOTE.—Two discharge rating curves were used for 1910, both very poorly defined. Discharges from July 7 to Aug. 8 applied indirectly because of shifting channel.

Daily gage height, in feet, and discharge, in second-feet, of Fish Creek below Solo Creek, for 1910–1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1			2.3	29	1.2	5.3		28
2			2.35	30	1.18	5.1	2.85	42
3			2.2	26	1.2	5.3	2.15	25
4			2.6	36	1.12	4.3	2.05	22
5			2.7	39	1.12	4.3	1.9	18.8
6			2.24	27	1.08	3.9	1.88	18.4
7			2.1	24	1.08	3.9	1.78	16.2
8			2.1	24	1.4	8.5	1.78	16.2
9			1.6	12.3	1.32	7.1	1.75	15.5
10			1.5	10.3		18.0		16.0
11			2.0	21	2.25	27	1.78	16.2
12			2.2	26	1.8	16.6	1.78	16.2
13			1.7	14.4	1.8	16.6		15.0
14			1.65	13.4		60	1.7	14.4
15			1.5	10.3	5.4	a 120		
16			1.5	10.3	3.15	50		
17			1.4	8.5	2.9	44		
18			1.4	8.5	2.75	40		
19			1.35	7.6	2.5	34		
20	1.9	18.8	1.3	6.8		28		
21	1.9	18.8	1.3	6.8	2.05	22		
22	1.8	16.6	1.3	6.8	1.92	19.3		
23	1.6	12.3	1.25	6.0	1.9	18.8		
24	1.55	11.3	1.25	6.0	1.75	15.5		
25	1.5	10.3	1.2	5.3	1.75	15.5		
26	1.45	9.4	1.2	5.3	1.7	14.4		
27	1.3	6.8		6.0		14.4		
28	1.3	6.8	1.3	6.8	1.7	14.4		
29	1.3	6.8		6.0	1.68	14.0		
30	2.0	21	1.2	5.3	1.68	14.0		
31			1.2	5.3	1.68	14.0		
Mean discharge		12.6		14.5		21.9		20.0
Second-feet per square mile		0.586		0.674		1.02		0.930
Run-off (depth in inches on drainage area)		0.24		0.78		1.18		0.24
Maximum		21		39		120		42
Minimum		6.8		5.3		3.9		14.4
Accuracy		B		B		C		B

a Approximate.

NOTE.—Discharge rating curve fairly well defined below 40 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Fish Creek below Solo Creek for 1910–1912—Continued.

Day.	June.		July.		August.		Day.	June.		July.		Aug	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.							1912—Con.						
1							21			1.80	15.1		
2							22	3.10	46				
3							23						
4							24	3.95	72	2.00	19.3		
5					1.59	11.0	25						
6			1.80	15.1	1.54	10.1	26	3.45	56				
7							27						
8							28			1.80	15.1		
9			1.56	10.5			29	2.00	19.3				
10							30			1.64	12.0		
11							31						
12	2.35	27	2.60	33			Mean discharge		43.4		18.5		
13													
14	2.00	19.3	2.10	22									
15													
16					1.50	9.4							
17			2.20	24									
18	3.70	64											
19													
20													

NOTE.—Discharge rating curves fairly well defined below 40 second-feet.

FISH CREEK ABOVE FAIRBANKS CREEK.

This station was established July 22, 1907, about one-fourth of a mile above the mouth of Fairbanks Creek. The channel was liable to shift, and different discharge curves were used for 1907 and 1908. Gage heights were obtained in cooperation with Messrs. Joslin, Wobber, and others.

Discharge measurements of Fish Creek above Fairbanks Creek in 1907–1909.

[Elevation, 925 feet.]

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1907.		*Feet.*	*Sec.-ft.*	1908—Con.		*Feet.*	*Sec.-ft.*
July 21	C. C. Covert	1.00	24	July 19	C. E. Ellsworth	0.85	16.8
25	....do	1.00	24	22	....do	.75	12.8
Aug. 3	....do	1.55	48	29	Geo. Neuner, jr	.75	15.4
4	Covert and White	1.35	38	Aug. 5	....do	.75	15.0
19	C. C. Covert	1.00	21				
				1909.			
1908.				June 4	C. E. Ellsworth		22
May 31	....do	2.40	107	28	....do		48
July 18	Ellsworth and Neuner	.85	16.0				

Daily gage height, in feet, and discharge, in second-feet, of Fish Creek above Fairbanks Creek for 1907–8.

[Drainage area, 39 square miles. Observer, Sherman White.]

Day.	July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1907.						
1	......	......	3.2	185	1.0	24
2	......	......	2.4	107	1.0	24
3	......	......	1.4	39	1.0	24
4	......	......	1.3	35	1.0	24
5	......	......	......	37	1.1	27
6	......	......	1.4	39	......	27
7	......	......	1.55	47	......	27
8	......	......	1.3	35	1.1	27
9	......	......	1.6	50	1.1	27
10	......	......	1.6	50	1.3	35
11	......	......	......	39	......	......
12	......	......	1.2	31	......	......
13	......	......	1.1	27	......	......
14	......	......	1.1	27	2.6	*a* 125
15	......	......	1.1	27	......	......
16	......	......	1.0	24	......	......
17	......	......	1.0	24	......	......
18	......	......	......	24	......	......
19	......	......	1.0	24	......	......
20	......	......	......	24	......	......
1907—Con.						
21	1.0	24	1.0	24	......	......
22	1.0	24	1.0	24	......	......
23	......	24	......	24	......	......
24	......	24	1.0	24	......	......
25	1.0	24	1.1	27	......	......
26	1.1	27	1.1	27	......	......
27	1.0	24	1.0	24	......	......
28	.9	21	1.0	24	......	......
29	.9	21	......	27	......	......
30	.8	18	1.2	31	......	......
31	.8	18	1.1	27	......	......
Mean discharge	......	22.6	......	36.9	......	26.6
Second-feet per square mile	......	0.579	......	0.946	......	0.682
Run-off (depth in inches on drainage area)	......	0.24	......	1.09	......	0.25
Maximum	......	27	......	185	......	125
Minimum	......	18	......	24	......	24
Accuracy	......	A	......	C	......	C

Daily gage height, in feet, and discharge, in second-feet, of Fish Creek above Fairbanks Creek for 1907–1908—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1			2.35	102				13.5
2				86				13.5
3				79				13.5
4				71				13.5
5			1.95	71			0.75	13.5
6			2.70	137				13.5
7				98				13.5
8				68				13.5
9			1.40	38				13.5
10				43			.75	13.5
11				55				13.5
12			1.80	61				12.0
13				55			.70	12.0
14				52				13.5
15			1.50	43				15.0
16			1.50	43				15.0
17				41			.82	15.6
18				41	0.85	16.5		16.2
19				38	.85	16.5		16.5
20			1.40	38		15.0		16.8
21						12.0	.89	17.7
22	3.60	227			.75	13.5		17.4
23		197				13.5		17.1
24		167				13.5		16.8
25		127				13.5		16.5
26		90				13.5		16.1
27		94				13.5	.82	15.6
28		98				13.5		
29		102			.75	13.5		
30		107				13.5		
31	2.40	107				13.5		
Mean discharge		132		63.0		13.9		14.8
Second-feet per square mile		3.38		1.62		0.356		0.380
Run-off (depth in inches on drainage area)		1.26		1.20		0.19		0.38
Maximum		227		137		16.5		17.7
Minimum		90		38		12.0		12.0
Accuracy		D		C		C		C

[a] Not included in mean.

NOTE.—Discharge rating curve fairly well defined below 150 second-feet.

FISH CREEK AT MOUTH.

A gaging station was established at the mouth of Fish Creek on May 1, 1908. The gage was a vertical staff driven into the right bank of the creek opposite Sodabloom's cabin.

High-water discharge measurements in 1908 were made from a car and cable. All others were made by wading. This station was maintained during 1908 in cooperation with Messrs. Joslin, Wobber, and others to obtain data regarding a proposed power development in the Little Chena basin.

No records were obtained in 1909. Daily records were kept during July and August, 1910, by the Survey. The relation between gage height and discharge was not the same for both years. Independent rating curves were used each year. The conditions at this station were favorable for accuracy and the records should be good.

Discharge measurements of Fish Creek at mouth in 1908, 1910, and 1911.

Date.	Hydrographer.	Gage height.	Dis-charge.	Date.	Hydrographer.	Gage height.	Dis-charge.
1908.		*Feet.*	*Sec.-ft.*	1910.		*Feet.*	*Sec.-ft.*
May 5	C. C. Covert	4.22	618	May 21	Ellsworth and Parker		195
6	....do	3.98	530	22	....do		106
6	Covert and White	4.20	646	July 4	Parker and Shaw	0.52	18.3
7	C. C. Covert	3.90	558	6	G. L. Parker	.50	18.5
7	....do	4.02	571	11	T. J. Shaw	.50	17.7
8	....do	3.64	385	19	....do	.47	16.9
9	Covert and White	3.70	525	25	....do	.70	33
28	....do	2.30	148	Aug. 2	....do	.47	16.4
30	C. C. Covert	2.75	208	9	G. L. Parker	.40	13.3
July 20	Covert and Ellsworth	.90	26	19	T. J. Shaw	1.45	127
21	C. E. Ellsworth	.88	26	24	Parker and Shaw	.82	40
30	Geo. Neuner, jr	.82	25				
Aug. 2	....do	1.00	29	1911.			
23	C. C. Covert	1.10	32	Aug. 6	C. E. Ellsworth		15.3

Daily gage height, in feet, and discharge, in second-feet, of Fish Creek at mouth for 1908 and 1910.

[Drainage area, 90.2 square miles. Observers: Sherman White, 1908; T. J. Shaw, 1910.]

Day.	May.		June.		July.		August.	
	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
1908.								
1	3.98	564	2.60	206			0.82	23
2	4.00	570	2.28	147			.99	28
3	4.25	650	1.98	105			.98	28
4	4.35	682	1.80	83			.92	25
5	4.28	660	2.25	142			.87	24
6	4.05	586	3.12	327			.82	22
7	3.95	554	2.42	170			.85	24
8	3.65	464	2.22	138			.89	25
9	3.65	464	1.90	95			.90	25
10	3.65	464	1.65	69			.88	25
11		445	1.75	78			.84	24
12	3.50	422	2.28	146			.80	22
13	3.45	409	2.15	128			.80	22
14	3.50	422	2.18	132			.87	24
15	3.48	417	2.58	202			.88	25
16	4.40	396	2.10	121			.90	25
17	4.35	383	2.10	121			.99	28
18	3.90	.538	2.62	210			.95	27
19	3.78	500	2.05	114			.94	27
20	3.75	493	1.90	95			.94	27
21	3.52	429					1.08	31
22	3.15	334					1.10	31
23	2.78	246					1.00	28
24	2.55	196					.98	28
25	2.50	186					.96	27
26	2.25	142					.95	27
27	1.98	105					1.00	28
28	2.25	142						
29	2.40	166			0.85	24		
30	2.80	250			.82	23		
31	2.80	250			.79	22		
Mean discharge		404		141				25.9
Second-feet per square mlie		4.48		1.56				0.287
Run-off (depth in inches on dranage area)		5.16		1.16				0.28
Maximum		682		327				31
Minimum		105		69				22
Accuracy		B		B				A

Daily gage height, in feet, and discharge, in second-feet, of Fish Creek at mouth for 1908 and 1910—Continued.

Day.	July.		August.		Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1910.					1910—Con.				
1	....	24	0.50	18.0	21	0.47	16.6	0.94	54
2	0.56	22	.47	16.6	22	.62	25	.82	42
3	.53	19.8	.46	16.1	23	.62	25	.74	35
4	.52	19.2	.46	16.1	24	.82	42	.78	38
5	.52	19.2	.44	15.2	25	.74	35	.88	48
6	.50	18.0	.42	14.2	26	.62	25	.84	44
7	.49	17.5	.38	12.7	27	.58	23	.78	38
8	.50	18.0	.40	13.3	28	.52	19.2	.76	36
9	.47	16.6	.40	13.3	29	.48	17.1	.71	32
10	.48	17.1	.40	13.3	30	.48	17.1	.67	29
					31	.54	20	....	25
11	.49	17.5	.39	13.0					
12	.50	18.0	.38	12.7					
13	.48	17.1	.37	12.4	Mean discharge	....	19.9	....	29.4
14	.48	17.1	.37	12.4					
15	.46	16.1	.38	12.7	Second-feet per square mile	....	0.221	....	0.326
16	.45	15.6	.41	13.8					
17	.42	14.2	.50	18.0	Run-off (depth in inches on drainage area)	....	0.25	....	0.38
18	.41	13.8	.98	59	Maximum	....	42	....	119
19	.45	15.6	1.40	119	Minimum	....	13.8	....	12.4
20	.46	16.1	1.05	68	Accuracy	....	A	....	A

NOTE.—Discharge curve well defined for all stages.

MILLER CREEK AT MOUTH.

A gage was installed on Miller Creek at its mouth May 13, 1908. It was maintained in cooperation with Messrs. Joslin, Wobber, and others during 1908, and by the United States Geological Survey independently in July and August, 1910. No daily records were obtained in 1909. Discharges were estimated from independent rating curves each year. The channel shifted so badly during 1910 that three rating curves were used for that season, but sufficient measurements were obtained to give fairly accurate estimates of daily discharges. The gage datum was not the same in 1910 as in 1908, and the channel conditions were so changed that an entirely different relation between gage heights and discharges existed for each season.

Discharge measurements of Miller Creek at mouth in 1907–8 and 1910–11.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1907.		*Feet.*	*Sec.-ft.*	1910.		*Feet.*	*Sec.-ft.*
July 6	C. C. Covert	....	7.0	May 21	C. E. Ellsworth	....	41
24	.....do	....	7.6	22	.....do	....	34
Aug. 20	.....do	....	8.0	July 4	Parker and Shaw	2.39	2.9
				6	G. L. Parker	2.37	2.8
1908.				11	T. J. Shaw	2.40	4.0
May 28	C. C. Covert	1.20	28	19	.....do	2.34	2.8
28	.....do	1.20	26	25	.....do	2.38	4.1
30	.....do	1.32	29	Aug. 2	.....do	2.33	2.8
July 20	Covert and Ellsworth	.60	4.2	7	Parker and Shaw	2.31	2.2
21	C. E. Ellsworth	.60	4.9	19	T. J. Shaw	2.70	15.8
30	Geo. Neuner, jr	.58	4.9	21	.....do	2.46	8.0
Aug. 3	.....do	.62	5.8	25	Parker and Shaw	2.42	6.1
				1911.			
				Aug. 6	C. E. Ellsworth	....	1.5

Daily gage height, in feet, and discharge, in second-feet, of Miller Creek at mouth for 1908 and 1910.

[Drainage area, 16.7 square miles. Observers: Sherman White, 1908; T. J. Shaw, 1910.]

Day.	1908								1910			
	May.		June.		July.		August.		July.		August.	
	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
1			1.40	39			0.58	4.6		3.5	2.35	3.3
2			1.10	19.6			.62	5.3	2.40	3.3	2.34	3.0
3			.98	14.8			.62	5.3	2.39	3.1	2.32	2.5
4			.90	12.0			.60	4.9	2.38	2.9	2.32	2.5
5			1.14	22			.58	4.6	2.37	2.7	2.32	2.5
6			1.60	55			.58	4.6	2.36	2.5	2.31	2.3
7			1.10	19.6			.58	4.6	2.36	2.5	2.31	2.3
8			1.02	16.1			.60	4.9	2.35	2.3	2.31	2.3
9			.88	11.4			.60	4.9	2.35	3.3	2.31	2.3
10			.85	10.6			.58	4.6	2.36	3.4	2.30	2.1
11			.90	12.0			.56	4.3	2.38	3.9	2.30	2.1
12			1.18	24			.54	4.0	2.41	4.6	2.30	2.1
13	2.05	91	1.28	30			.54	4.0	2.39	4.1	2.29	2.0
14	2.08	94	1.32	33			.60	4.9	2.36	3.4	2.29	2.0
15	2.18	101	1.24	26			.60	4.9	2.36	3.4	2.30	2.1
16	2.45	122	1.02	16.1			.62	5.3	2.34	3.0	2.31	2.3
17	2.42	120	.95	13.8			.60	4.9	2.33	2.8	2.36	3.4
18	2.20	103	1.10	19.6			.60	4.9	2.33	2.8	2.53	10.4
19	2.18	101	.89	11.7			.60	4.9	2.34	3.0	2.65	13.5
20	2.15	99	.88	11.4	0.60	4.9	.61	5.1	2.34	3.0	2.52	10.0
21	1.90	79			.60	4.9	.67	6.4	2.37	3.6	2.48	8.4
22	1.00	55				4.9	.67	6.4	2.39	4.1	2.43	6.7
23	1.22	26				4.9	.65	5.9	2.40	4.3	2.42	6.4
24	1.22	26				4.9	.62	5.3	2.43	5.2	2.42	6.4
25	1.15	22				4.9	.61	5.1	2.39	4.1	2.42	6.4
26	.95	13.8				4.9	.60	4.9	2.36	3.4	2.42	6.4
27	.98	14.8				4.9	.61	5.1	2.34	3.0	2.40	5.7
28	1.18	24				4.9			2.33	2.8	2.40	5.7
29	1.25	30			.60	4.9			2.32	2.5	2.38	5.2
30	1.35	35			.58	4.6			2.36	3.4	2.36	4.6
31	1.35	35			.56	4.3			2.36	3.4		4.4
Mean discharge		62.7		20.9		4.82		4.99		3.33		4.56
Second-feet per square mile		3.75		1.25		0.289		0.299		0.199		0.273
Run-off (depth in inches on drainage area)		2.65		0.93		0.13		0.30		0.23		0.31
Maximum		122		55		4.9		6.4		5.2		13.5
Minimum		13.8		10.6		4.3		4.0		2.3		2.0
Accuracy		C		B		B		B		B		B

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Little Chena River drainage basin:

Miscellaneous measurements in Little Chena River drainage basin from 1907 to 1911.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. m.*	*Sec.-ft.*
July 10, 1910	Sorrels Creek	Little Chena River	Mouth	8.7	41.5	0.21
July 31, 1910	do	do	do	14.9	41.5	.36
July 7, 1910	Solo Creek	Fish Creek	do	.89	5.1	.18
Aug. 9, 1910	do	do	do	.76	5.1	.15
Aug. 22, 1910	do	do	do	2.5	5.1	.49
July 20, 1907	Bear Creek	do	Below Tecumseh Creek.	8.4	12.0	.70
Aug. 22, 1907	do	do	do	7.0	12.0	.58
July 19, 1908	do	do	do	5.4	12.0	.45
July 7, 1910	do	do	Mouth	3.2	13.8	.23
Aug. 9, 1910	do	do	do	2.6	13.8	.19
Aug. 23, 1910	do	do	do	6.6	13.8	.48
Aug. 6, 1911	do	do	do	2.8	13.8	.20
July 20, 1907	Fairbanks Creek	do	Elevation 1,400 feet	1.3		
July 5, 1907	do	do	Elevation 1,375 feet	.72		
July 24, 1907	do	do	Elevation 1,300 feet	1.4		
Do	do	do	Elevation 1,250 feet	2.2		
July 7, 1910	do	do	Mouth	3.8	18.9	.20
Aug. 9, 1910	do	do	do	2.7	18.9	.14
Aug. 23, 1910	do	do	do	7.4	18.9	.39
Aug. 7, 1907	Miller Creek	do	Above Heim Creek	4.9	6.0	.82
July 21, 1908	do	do	do	2.5	6.0	.42
Aug. 1, 1908	do	do	do	2.2	6.0	.37
July 6, 1910	do	do	do	1.7	6.0	.28
Aug. 6, 1907	do	do	Below Heim Creek	8.0	10.0	.80
Aug. 7, 1907	do	do	do	8.0	10.0	.80
July 21, 1908	do	do	do	3.1	10.0	.31
Aug. 1, 1908	do	do	do	2.4	10.0	.24
July 6, 1910	Heim Creek	Miller Creek	Mouth	.44	4.0	.11

TOLOVANA RIVER DRAINAGE BASIN.

DESCRIPTION.

Tolovana River enters Tanana River from the north about midway between Fairbanks and Fort Gibbon. The main stem of the river rises in the divide between Hess and Beaver creeks and flows in a general southwesterly direction with a length of about 125 miles by map measure. The first 30 miles of its course is through a narrow valley with bounding ridges about 2,000 feet high. The valley broadens sharply to about 4 miles, and there West Fork joins the main stream. About 40 miles below West Fork the Tolovana leaves the hills and enters a large northern indentation of the Tanana Valley. A little beyond the foothills it receives the waters of Tatalina and Chatanika rivers from the east. Between West Fork and the Tanana the stream has a very low gradient and follows a tortuous course between deep-cut alluvial banks. The lowlands are covered with many sloughs and small lakes, rendering travel almost impossible during the summer months except by boat.

No records of stream flow were obtained on the main stream. The West Fork, Washington Creek, and Chatanika River basins will be discussed separately.

WEST FORK OF TOLOVANA RIVER DRAINAGE BASIN.

DESCRIPTION.

West Fork of Tolovana River is formed by three main arteries—Goose, Starvation, and Moose creeks—which flow northeastward in generally parallel courses for the greater part of their length. They are separated by benchlike divides which rise 600 to 800 feet above the valley bottoms.

Goose Creek is the largest of the three and drains the highest ground. Sawtooth Mountain, rising high above it on the north, contributes the greater part of the run-off. The valley has an average width of perhaps one-fourth mile and is rather difficult to travel, having an extra thickness of the prevalent moss and containing many "nigger-heads" in a bed of muck and water. The bottom land is dotted with clumps of spruce and birch, but the timber generally is small. The creek crosses from side to side of the valley, and its gravelly bed contains large bowlders. The right slope is steep and makes a sharp angle with the bottom land and is unbroken by any noticeable water-courses below Buckeye Creek. The left bank is marked by numerous feeders, with deep-cut valleys extending back for several miles.

Buckeye Creek is tributary to Goose Creek from the left about 10 miles from the mouth. It has shown sufficient gold to warrant careful prospecting. The creek, however, probably never furnishes sufficient water for anything more than the washing of spring dumps.

Starvation and Moose creeks were visited only at the mouth, but as seen from a distance the lower valleys appeared to have the same general characteristics as those of Goose Creek.

No daily records of stream flow were obtained in this basin.

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the West Fork of Tolovana River drainage basin in 1908:

Miscellaneous measurements in West Fork of Tolovana River drainage basin in 1908.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
1908.				*Sec.-ft.*	*Sq. mi.*	*Sec.-ft.*
Aug. 13	West Fork of Tolovana River.	Tolovana River	Below Moose Creek	4.0	43.8	0.091
13	Starvation Creek	West Fork of Tolovana River.	Mouth	2.2	23.8	.092
13	Moose Creek	do	do	1.9	19.8	.096
13	Goose Creek	do	4 miles above mouth	3.2	41.0	.078
14	do	do	Below Buckeye Creek	1.6	20.8	.077
14	Buckeye Creek	Goose Creek	Mouth	.2	10.6	.019

WASHINGTON CREEK DRAINAGE BASIN.

DESCRIPTION.

Washington Creek rises in the southern slope of the dividing ridge south of Beaver Creek drainage basin and flows southwestward into Tatalina River about 15 miles above the confluence of that stream with the Tolovana. It parallels the Chatanika, from which it is separated at a distance of about 6 miles by a high dividing ridge. The creek is about 35 miles long and drains an area of 198 square miles. It is shown on the reconnaissance map of the Fairbanks quadrangle. The valley is long and narrow, is well timbered, and is bordered on each side by high ridges, which are in places from 1,200 to 1,800 feet above the stream bed.

Aggie Creek, which enters Washington Creek about 12 miles above its mouth, is its only important tributary. This stream is about 12 miles long and drains an area of 35.8 square miles.

A fall of about 200 feet in 8 miles on Washington Creek below Aggie Creek affords opportunity for some small power developments. In 1908 the break-up on Washington Creek occurred about May 5, but there was considerable ice in the stream until after May 9, and the water could not have been used in a diverting ditch until about May 20.

The records of this basin were obtained, in cooperation with Martin Harrais, to determine the possibility of using the stream for the development of power.

WASHINGTON CREEK ABOVE AGGIE CREEK.

This station was established May 23, 1908, about 500 feet above the mouth of Aggie Creek. The gage, known as gage No. 2, was fastened to a wooden trestle under the footbridge constructed for high-water measurements. Conditions at the station were favorable for accuracy.

Discharge measurements of Washington Creek above Aggie Creek in 1908.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 23	3.65	311	July 28	2.10	19.3
24	3.60	304	Aug. 19	2.10	17.3
July 27	2.08	18.2			

Daily gage height, in feet, and discharge, in second-feet, of Washington Creek above Aggie Creek for 1908.

[Drainage area, 117 square miles. Observer, E. J. Berger.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.45	266		45	2.15	22	2.25	30
2			3.22	203		45	2.18	24	2.32	38
3			3.00	146		45	2.25	30	2.58	67
4			2.95	135	2.40	45	2.20	26	2.80	104
5			2.82	109	2.40	45	2.20	26		
6			3.38	245	2.35	40	2.18	24		
7			3.38	245	2.40	45	2.15	22		
8			3.08	103	2.50	57	2.15	22		
9			2.90	124	2.55	63	2.15	22		
10			2.68	82	2.45	51	2.15	22		
11			2.55	63	2.38	43	2.15	22		
12			2.48	54	2.32	37	2.15	22		
13			2.62	74	2.20	26	2.15	22		
14			2.62	74	2.20	26	2.15	22		
15			4.50	557	2.25	30	2.15	22		
16			3.75	342	2.20	26	2.15	22		
17			3.32	231	2.20	26	2.15	22		
18			3.00	146	2.22	28	2.20	26		
19			3.20	196	2.22	28	2.15	22		
20			3.22	203	2.20	26	2.22	28		
21			3.10	170	2.20	26	2.20	26		
22			3.78	359	2.18	24	2.22	28		
23	3.65	316	3.12	176	2.10	18	2.22	28		
24	3.65	316	2.82	109	2.15	22	2.20	26		
25	3.45	266	2.60	70	2.15	22	2.15	22		
26	3.20	196	2.40	45	2.15	22	2.20	26		
27	3.15	183	2.42	48	2.15	22	2.20	26		
28	3.35	236		48	2.20	26	2.20	26		
29	3.50	278		48	2.22	28	2.25	30		
30	4.00	408		48	2.15	22	2.25	30		
31	3.75	342			2.15	22	2.20	26		
Mean discharge		282		159		33.2		24.6		59.8
Second-feet per square mile		2.41		1.36		0.284		0.210		0.512
Run-off (depth in inches on drainage area)		0.81		1.52		0.33		0.24		0.08
Maximum		408		557		63		30		104
Minimum		183		45		18		22		30
Accuracy		C		B		B		B		B

NOTE.—Discharge curve fairly well defined below 400 second-feet.

WASHINGTON CREEK BELOW AGGIE CREEK.

This station was established May 5, 1908, by E. J. Berger. Gage No. 1, first installed, was replaced on May 24 by gage No. 4, which is located about 500 feet below the mouth of Aggie Creek, on the left bank, and is referred to a spike driven in a notch cut at the base of the stream side of a cottonwood tree about 10 inches in diameter and 10 feet back from the edge of the bank; the top of the spike is 9.9 feet above the gage datum.

Theoretically the discharge at gage No. 4 should represent the totals at Nos. 2 and 3,[1] but it does not always do so, for during high

[1] See Aggie Creek at mouth, p. 275.

water a small stream from the left bank discharges between the gages, and during low water more or less seepage takes place through the gravel. The records check very closely, however, and probably give very nearly the actual discharge of the creek during the season.

Discharge measurements of Washington Creek below Aggie Creek in 1908.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-feet.*		*Feet.*	*Sec.-feet.*
May 23	3.30	419	July 28	1.85	27.0
24	3.35	440	Aug. 18	1.80	25.9
July 27	1.80	25.8	19	1.80	25.6

Daily gage height, in feet, and discharge, in second-feet, of Washington Creek below Aggie Creek for 1908.

[Drainage area, 147 square miles. Observer, E. J. Berger.]

Day.	May.[a]		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.12	332		53	1.80	28	1.95	38
2			3.00	284		53	1.84	31	2.06	49
3			2.75	185		53	1.92	37	2.32	82
4			2.70	166	2.10	52	1.86	33	2.55	124
5		840	2.62	141	2.10	52	1.85	32		
6		720	2.98	279	2.05	48	1.80	28		
7		760	2.96	274	2.11	53	1.80	28		
8		880	2.78	194	2.24	69	1.80	28		
9		920	2.64	149	2.30	88	1.80	28		
10		1,200	2.45	104	2.18	61	1.80	28		
11		760	2.32	80	2.18	61	1.80	28		
12		688	2.25	70	2.05	48	1.80	28		
13		1,120	2.38	89	1.86	33	1.80	28		
14		1,160	2.42	98	1.85	32	1.80	28		
15		1,400	3.66	600	1.92	37	1.80	28		
16		1,280	3.18	360	1.87	34	1.80	28		
17		1,240	2.91	246	1.87	34	1.80	28		
18		1,160	2.68	160	1.91	36	1.85	32		
19		1,040	2.82	210	1.91	36	1.80	28		
20		1,120	2.84	218	1.88	34	1.88	34		
21		840	2.75	185	1.85	32	1.85	32		
22		490	3.22	375	1.83	30	1.88	34		
23	3.10	328	2.76	188	1.75	24	1.88	34		
24	3.35	440	2.52	118	1.82	30	1.85	32		
25	3.18	352	2.30	77	1.81	29	1.80	28		
26	2.92	250	2.10	52	1.80	28	1.86	33		
27	2.88	234	2.15	58	1.80	28	1.86	33		
28	3.06	310		56	1.90	35	1.86	33		
29	3.20	370		56	1.90	35	1.92	37		
30	3.52	525		56	1.79	27	1.92	37		
31	3.40	465			1.78	26	1.86	33		
Mean discharge		774		182		41.3		30.8		73.1
Second-feet per square mile		5.26		1.23		0.281		0.210		0.498
Run-off (depth in inches on drainage area)		5.28		1.37		0.324		0.24		0.07
Maximum		1,400		600		88		37		124
Minimum		234		52		26		28		38
Accuracy		D		B		B		B		B

[a] Discharges from May 5 to 22, inclusive, are based on readings from gage No. 1, and on account of unfavorable channel conditions are approximate.

NOTE.—Discharge curve fairly well defined below 600 second-feet.

AGGIE CREEK AT MOUTH.

This station was established May 23, 1908. The gage, known as gage No. 3, is located on the right bank about 1,000 feet above the mouth of the stream. It is referred to a spike driven in the top of a stump about 5 feet farther downstream on the same side; the top of the spike is 6.10 feet above the datum of the gage.

Discharge measurements of Aggie Creek at mouth in 1908.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-feet.*		*Feet.*	*Sec.-feet.*
May 23	2.92	108	July 28	1.09	8.8
24	3.29	136	Aug. 19	.90	7.0
July 27	.95	6.3			

Daily gage height, in feet, and discharge, in second-feet, of Aggie Creek at mouth for 1908.

[Drainage area, 35.8 square miles. Observer, E. J. Berger.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.30	65		7.5	0.92	6.2	1.08	8.5
2			2.50	79		7.5	1.00	7.5	1.18	10.6
3			1.80	36		7.5	1.00	7.5	1.30	14.0
4			1.72	31	1.00	7.5	.98	7.0	1.35	16.0
5			1.80	36	1.00	7.5	.95	6.5		
6			1.78	34	1.02	7.8	.92	6.2		
7			1.65	28	1.05	8.0	.90	6.0		
8			1.75	34	1.17	11.0	.90	6.0		
9			1.58	24	1.30	14.0	.90	6.0		
10			1.47	20	1.07	9.5	.90	6.0		
11			1.40	17	1.10	9.0	.90	6.0		
12			1.38	16	1.02	7.8	.90	6.0		
13			1.32	14	.98	7.0	.90	6.0		
14			1.55	23	.98	7.0	.90	6.0		
15			1.90	41	.98	7.0	.90	6.0		
16			1.50	21	1.02	7.8	.90	6.0		
17			1.35	16	1.02	7.8	.90	6.0		
18			1.30	14	1.00	7.5	.90	6.0		
19			1.30	14	1.00	7.5	.90	6.0		
20			1.30	14	1.00	7.5	.90	6.0		
21			1.30	14	1.00	7.5	.90	6.0		
22			1.35	16	.95	6.5	.90	6.0		
23	2.90	107	1.17	11	.95	6.5	.90	6.0		
24	3.15	125	1.15	10	1.00	7.5	.90	6.0		
25	2.60	86	1.05	8.0	.98	7.0	.90	6.0		
26	2.06	50	1.07	8.5	.95	6.5	.95	6.5		
27	2.05	50	1.02	7.8	.95	6.5	.95	6.5		
28	2.40	72		7.8	1.05	8.0	.95	6.5		
29	2.67	91		7.8	.98	7.0	.95	6.5		
30	3.02	116		7.8	.88	5.0	.95	6.5		
31	3.12	123			.85	4.5	.95	6.5		
Mean discharge		91.2		22.5		7.58		6.26		12.2
Second-feet per square mile		2.55		0.629		0.211		0.174		0.341
Run-off (depth in inches on drainage area)		0.85		0.70		0.24		0.20		0.05
Maximum		125		79		14.0		7.5		16.0
Minimum		50		7.8		4.5		6.0		8.5
Accuracy		B		B		B		B		B

NOTE.—Discharge curve fairly well defined for all stages.

CHATANIKA RIVER DRAINAGE BASIN.

DESCRIPTION.

Chatanika River is formed by the junction of Faith and McManus creeks, which drain the high ridge constituting the divide between the lower Tanana and Yukon basins. The river flows southwestward, in a winding course, through a long and rather narrow valley, and unites with the Tolovana from the east about 30 miles above the confluence of that stream with the Tanana. It clings mostly to the western side of the valley, which is from one-half mile to 7 miles wide and about 80 miles long. Its drainage area above its mouth is approximately 1,300 square miles.

Below the junction of Faith and McManus creeks the stream has a shifting gravelly bottom. At low and medium waters it flows in a series of pools and rapids in a channel 75 to 200 feet wide; but during high water it may spread through several channels, covering a width of 100 to 400 feet. This high-water channel is usually well defined by steep alluvial banks 8 to 10 feet high.

Below Poker Creek, a tributary from the right about 40 miles downstream from the junction, the valley widens and the bottom lands become marshy and swampy. From the left, the Chatanika receives drainage from Cleary, Eldorado, Dome, and Vault creeks, and other less important streams from the mining district proper. Below these tributaries the valley narrows to a gorgelike channel, which it follows for about 10 miles, after which the dividing ridges disappear and the stream meanders through the low swampy grounds to the north of Tanana River. About 10 miles from its mouth Goldstream Creek, its largest tributary, joins it from the left.

The average elevation of the divides in the upper drainage area of the Chatanika is between 3,000 and 4,000 feet above sea level, and the altitude of the ridges bounding the valley on the east and west is about 2,000 feet. Below an altitude of 1,800 to 2,000 feet the slopes are heavily timbered.

The tributary streams from the right are short and precipitous, flowing through V-shaped valleys. Those from the left have less precipitous courses and broader valleys and gradually lose themselves in the rather broad expanse of swamplike bottom lands.

McManus Creek, the left fork of Chatanika River, rises between the headwaters of Birch Creek, a tributary of the Yukon, and the west fork of the Chena, a tributary of the Tanana. The ridges that surround it have a general elevation of about 3,000 feet. Its principal tributaries are Montana and Idaho creeks, from the north, and Smith Creek, which enters from the south near its mouth. Pool Creek is tributary to Smith Creek.

Faith Creek, the right fork of Chatanika River, has its source in the southeasterly slope of the high ridges separating the Beaver and Birch creek drainage basins from that of the Chatanika. It occupies a rather narrow, irregular valley, very steep in its upper course, and drains an area of 51 square miles. It is formed by the union of Hope and Charity creeks. Homestake Creek is a tributary of Charity Creek.

In the upper portion of the valley considerable ice remains as late as the middle of July, especially in Charity Creek and along Faith Creek below the mouth of Charity Creek.

The altitude and drainage area of the upper Chatanika has attracted the attention of "outside" capital for some time. The general topography has seemed suitable for a possible water supply by ditch line to the mining district proper, and the favorable slope of portions of Faith and McManus creeks has made them attractive to the promotor for hydraulicking. Actual records of stream flow, however, have shown that it would not be feasible to undertake to convey water from this basin to the Fairbanks mining district.

McMANUS CREEK AT MOUTH.

A gaging weir was established on McManus Creek near its mouth June 20, 1907, by the Chatanika Ditch Co., and records were kept until the weir was washed out on September 5. The keeping of daily records was not resumed until May 25, 1910, when a staff gage was installed near the mouth of the creek opposite the Faith Creek road house. The channel remained fairly stable until 1912. Two rating curves were used for that season. The gage datum varied from year to year but remained at a constant elevation during each season. The rating curves are fairly well defined below 400 second-feet.

Discharge measurements of McManus Creek at mouth in 1907–8 and 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1907.	*Feet.*	*Sec.-ft.*	1910—Contd.	*Feet.*	*Sec.-ft.*	1911—Contd.	*Feet.*	*Sec.-ft.*
July 10		15.6	June 12	3.65	315	Aug. 4	2.74	11.0
10		16.4	12	3.54	250	12	2.82	18.7
12		15.6	July 9	2.79	23			
			Aug. 1	2.96	50	1912.		
1908.						June 10	3.20	84
July 14		59	1911.			26	3.50	206
			June 15	3.58	254	July 23	2.88	26
1910.			16	3.45	175	Aug. 16	2.98	44
May 25	3.89	393	July 14	2.89	28			

Daily discharge, in second-feet, of McManus Creek near mouth for 1907.

[Elevation, 1,375 feet; drainage area, 80 square miles.]

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		21.6	81.2	71.5	21	34.8	26.0	32.2	
2		20.1	80.8	62.8	22	31.2	21.2	68.7	
3		19.0	56.1	57.8	23	34.8	17.8	50.3	
4		18.5	51.2	57.2	24	25.0	21.4	67.1	
5		17.8	63.4		25	21.7	19.1	81.2	
6		16.1	60.6		26	25.0	38.6	102.0	
7		17.5	98.6		27	24.3	29.9	92.6	
8		17.8	84.3		28	31.1	23.9	91.2	
9		15.8	75.6		29	26.0	21.8	114.0	
10		15.0	77.8		30	23.2	18.8	112.0	
11		16.1	62.2		31		16.7	94.1	
12		15.0	49.8						
13		15.4	45.5		Mean discharge	28.5	21.4	66.4	
14		17.8	40.0						
15		18.5	37.2		Second-feet per square mile	0.356	0.268	0.830	
16		19.0	42.4						
17		21.6	39.0		Run-off (depth in inches on drainage area)	0.15	0.31	0.96	
18		34.7	37.4						
19		40.0	34.7						
20	34.8	31.6	33.6						

NOTE.—These discharges were measured by weir and were furnished by the Chatanika Ditch Co.

Daily gage height, in feet, and discharge, in second-feet, of McManus Creek at mouth for 1910–1912.

[Drainage area, 80 square miles. Observers: Joseph Pringle, 1910; George Loper, 1911–12.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.										
1			3.52	242	2.80	23	2.92	42	3.02	64
2			3.38	183	2.80	23	2.87	34	3.00	59
3			3.36	175	2.81	24	2.86	32	3.00	59
4			3.30	152	2.80	23	2.82	26	3.08	80
5			3.48	225	2.92	42	2.80	23	3.32	160
6			3.31	156	2.89	36	2.80	23	3.42	199
7			3.16	104	2.80	23	2.80	23	3.39	187
8			3.10	85	2.80	23	2.78	21	3.34	168
9			3.21	120	2.79	22	2.76	19.0	3.27	141
10			4.62	760	2.78	21	2.75	18.0	3.21	120
11			4.05	486	2.78	21	2.74	17.0	3.16	104
12			3.60	277	2.78	21	2.74	17.0	3.08	80
13			3.30	152	2.78	21	2.72	15.0	3.04	69
14			3.16	104	2.77	20	2.72	15.0	3.14	97
15			3.10	85	2.76	19.0	2.70	13.0	3.61	282
16			3.10	85	2.76	19.0	2.70	13.0	3.48	225
17			3.04	69	2.75	18.0	2.73	16.0	3.39	187
18			3.00	59	2.74	17.0	2.92	42	3.32	160
19			2.99	57	2.74	17.0	3.60	277	3.26	138
20			2.97	53	2.74	17.0	3.84	387	3.30	152
21			3.00	59	2.75	18.0	3.38	183	3.29	148
22			3.60	277	2.81	24	3.16	104	3.26	138
23			3.18	110	2.86	32	3.06	75	3.13	94
24			3.14	97	3.18	110	3.13	94	3.08	80
25	3.78	359	3.12	91	2.98	55	3.24	130	3.05	72
26	3.38	183	3.08	80	2.86	32	3.28	145		
27	3.32	160	3.15	100	2.80	23	3.26	138		
28	3.36	175	3.14	97	2.80	23	3.22	123		
29	3.52	242	3.05	72	2.78	21	3.17	107		
30	3.55	255	2.85	30	2.96	51	3.10	85		
31	3.60	277			3.00	59	3.04	69		
Mean discharge		236		155		29.0		75.0		131
Second-feet per square mile		2.95		1.94		0.362		0.938		1.64
Run-off (depth in inches on drainage area)		0.77		2.16		0.42		1.08		1.52
Maximum		359		760		110		387		282
Minimum		160		30		17		13		59
Accuracy		A		B		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of McManus Creek at mouth for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1	....	....	3.75	322	3.18	94	2.75	12.0	2.92	34
2	....	....	3.85	368	3.32	140	2.75	12.0	3.05	60
3	....	....	3.85	368	3.40	170	2.75	12.0	3.02	53
4	....	....	3.75	322	3.22	107	2.75	12.0	3.00	48
5	....	....	3.75	322	3.35	152	2.75	12.0	2.98	44
6	....	....	3.95	414	3.35	152	2.75	12.0	2.95	39
7	....	....	3.65	278	3.30	133	2.75	12.0	2.95	39
8	....	....	3.60	255	3.08	67	2.75	12.0	2.95	39
9	....	....	3.55	233	2.98	44	2.75	12.0	2.90	30
10	....	....	3.45	190	2.90	30	2.78	15.0	2.90	30
11	....	....	3.45	190	2.88	27	2.85	24	2.92	34
12	....	....	3.55	233	2.98	44	2.82	19.6	2.90	30
13	....	....	3.60	255	2.92	34	2.80	17.0	2.85	24
14	....	....	3.50	211	2.88	27	2.82	19.6	2.85	24
15	....	....	3.52	220	2.85	24	3.82	354	2.85	24
16	....	....	3.60	255	2.88	27	3.48	203	2.90	30
17	....	....	3.62	264	2.85	24	3.48	203	2.90	30
18	....	....	3.55	233	2.85	24	3.32	140	2.88	27
19	....	....	3.55	233	2.85	24	3.18	94	2.85	24
20	....	....	3.45	190	2.80	17.0	3.12	78	2.85	24
21	....	....	3.38	163	2.80	17.0	3.05	60	2.85	24
22	....	....	3.32	140	2.80	17.0	3.00	48	2.85	24
23	....	....	3.22	107	2.80	17.0	2.98	44	2.85	24
24	4.15	508	3.18	94	2.80	17.0	2.95	39	2.90	30
25	4.35	602	3.10	72	2.78	15.0	2.95	39	....	....
26	4.40	626	3.10	72	2.80	17.0	2.95	39	....	....
27	4.15	508	3.08	67	2.80	17.0	2.95	39	....	....
28	4.00	438	3.00	48	2.78	15.0	2.95	39	....	....
29	4.00	438	3.00	48	2.75	12.0	2.90	30	....	....
30	3.75	322	3.08	67	2.75	12.0	2.90	30	....	....
31	4.00	438	....	....	2.75	12.0	2.90	30	....	....
Mean discharge	....	485	....	208	....	49.3	....	55.2	....	32.9
Second-feet per square mile	....	6.06	....	2.60	....	0.617	....	0.690	....	0.411
Run-off (depth in inches on drainage area)	....	1.80	....	3.00	....	0.71	....	0.80	....	0.38
Maximum	....	626	....	414	....	170	....	354	....	60
Minimum	....	322	....	48	....	12.0	....	12.0	....	24
Accuracy	....	B	....	B	....	A	....	A	....	A

Daily gage height, in feet, and discharge, in second-feet, of McManus Creek at mouth for 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1			3.68	257	3.02	53	2.95	39	3.00	48
2			4.22	508	3.00	48	2.90	30	3.05	60
3			4.05	426	3.02	53	2.90	30	3.10	72
4			3.62	232	2.98	44	2.90	30	3.10	72
5			3.38	141	2.95	39	2.88	27	3.15	86
6			3.25	100	2.90	30	2.85	24	3.12	78
7			3.15	71	2.90	30	3.10	72	3.05	60
8			3.10	58	2.90	30	3.05	60	3.05	60
9			3.20	84	2.90	30	3.00	48	3.05	60
10			3.18	79	2.85	24	2.98	44	3.00	48
11			3.10	58	2.85	24	3.08	67	3.00	48
12			3.32	122	2.88	27	3.12	78	3.00	48
13			3.55	204	2.85	24	3.05	60	3.00	48
14			3.32	122	2.90	30	3.00	48	3.00	48
15	3.75	288	3.20	84	2.90	30	3.00	48	3.10	72
16	3.80	310	3.38	141	2.88	27	2.95	39	3.15	86
17	3.68	257	3.30	115	2.90	30	2.95	39	3.28	126
18	3.58	215	3.22	90	2.90	30	2.95	39	3.38	160
19	3.45	166	4.00	402	2.90	30	2.95	39	3.28	126
20	3.30	115	3.55	204	2.90	30	2.92	34	3.45	186
21	3.30	115	3.32	122	2.90	30	2.92	34	3.45	186
22	3.25	100	3.28	109	2.90	30	2.92	34	3.35	150
23	3.48	177	4.25	522	2.88	27	2.92	34	3.28	126
24	3.18	79	3.88	346	2.85	24	2.95	39	3.20	100
25	3.15	71	3.90	355	2.85	24	2.98	44	3.15	86
26	3.12	63	3.58	239	2.90	30	3.02	53	3.15	86
27	3.10	58	3.38	160	2.98	44	3.08	67	3.10	72
28	3.45	166	3.25	116	3.08	67	3.05	60	3.10	72
29	3.78	301	3.15	86	3.02	53	3.00	48	3.12	78
30	3.52	192	3.08	67	3.00	48	3.00	48	3.15	86
31	3.32	122			2.95	39	3.00	48		
Mean discharge		164		187		34.8		45.3		87.8
Second-feet per square mile		2.05		2.34		0.435		0.507		1.10
Run-off (depth in inches on drainage area)		1.30		2.61		0.50		0.50		1.23
Maximum		310		522		67		78		186
Minimum		58		58		24		24		48
Accuracy		B		C		A		A		A

CHATANIKA RIVER BELOW FAITH CREEK.

A gaging station was established July 16, 1907, about 2,000 feet below the confluence of Faith and McManus creeks, in cooperation with the Chatanika Ditch Co., to determine the amount of water available for diversion from that point to the Fairbanks placer mines.

Daily records were kept during the open seasons of 1907, 1908, and 1910–1912. The gage was referred to the top of a post set firmly in the center of a log crib on the left bank of the creek at the measuring section. The distance from the top of the reference stake to the zero of the gage was 2.73 feet during 1907 and 1908, 3.90 feet in 1910, 4.52 feet in 1911, and 4.04 feet in 1912. The channel was composed of sand and gravel and was liable to small changes, but not such as would appreciably affect the relation between gage height and discharge except during extreme high water. Measurements were made from a car and cable during the high stages and by wading at low and medium stages. Discharge curves are well defined for all stages except extremely high water. The conditions at the station were favorable for accuracy and the records should be excellent. The records show a minimum discharge of 24 second-feet from August 4 to 9, 1911.

Discharge measurements of Chatanika River below Faith Creek in 1907–1912.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
1907.			
July 16	C. C. Covert	1.58	52
26	E. B. Brigham	1.80	80
Aug. 3	.....do	1.89	96
7	.....do	2.26	188
1908.			
May 11	C. W. McConaughy	a 3.90	311
13	.....do	a 3.40	297
13	.....do	a 3.40	334
13	.....do	a 3.48	396
14	.....do	a 3.37	300
14	.....do	a 3.54	367
21	.....do	4.15	1,430
June 26	.....do	1.95	130
July 12	C. C. Covert	2.05	144
13	C. E. Ellsworth	2.15	178
13	.....do	2.03	119
Aug. 31	C. C. Covert	2.05	142
1909.			
June 6	C. E. Ellsworth	2.42	229
26	.....do	2.28	239
Aug. 17	.....do	2.01	134
1910.			
May 25	G. L. Parker	4.39	699
June 11	.....do	4.58	925
12	.....do	4.08	535
July 9	.....do	2.73	56
Aug. 1	.....do	3.01	99
1911.			
June 15	C. E. Ellsworth	4.76	592
16	.....do	4.67	489
July 15	.....do	3.39	57
Aug. 4	.....do	3.19	27
12	.....do	3.50	61
1912.			
June 10	C. E. Ellsworth	3.44	166
26	.....do	3.93	375
July 23	.....do	2.98	66
Aug. 16	.....do	3.22	101

a Backwater from ice jam below station.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Faith Creek for 1907–8 and 1910–1912.

[Drainage area, 132 square miles. Observers: M. T. Kerrick and Herman Salchow, 1907–8; Joseph Pringle, 1910; George Loper, 1911–12.]

Day.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.
1907.						
1			1.80	82	2.08	145
2			2.02	131	2.03	133
3			1.86	96	2.00	126
4			1.93	109	2.01	128
5			1.95	114	2.06	140
6			1.95	114	2.01	128
7			2.25	205	1.98	121
8			2.12	157	2.02	131
9			2.05	138	1.99	124
10			2.02	131	1.97	119
11			1.92	107	2.34	243
12			1.85	95	5.00	2,190
13			1.85	95	3.20	720
14			1.80	82	2.86	503
15			1.80	82	2.77	453
16	1.58	52	1.80	82	3.24	750
17	1.65	60	1.80	82	3.05	620
18	1.86	96	1.78	78	2.78	463
19	1.80	82	1.75	72	2.63	385
20	1.75	72	1.75	72	2.56	350
1907—Con.						
21	1.70	66	1.75	72	2.50	320
22	1.62	57	1.98	121	2.43	285
23	1.60	55	1.92	107	2.35	248
24	1.64	59	2.04	136	2.31	230
25	1.75	72	2.22	193	2.29	221
26	1.85	95	2.25	205	2.29	221
27	1.75	72	2.15	168	2.30	225
28	1.67	62	2.13	161	2.34	243
29	1.65	60	2.25	205	2.42	280
30	1.60	55	2.25	205	2.36	252
31	1.60	55		171		
Mean discharge		66.9		125		350
Second-feet per square mile		0.507		0.947		2.65
Run-off (depth in inches on drainage area)		0.30		1.09		2.96
Maximum		96		205		2,190
Minimum		52		72		119
Accuracy		A		A		B

NOTE.—From May 11 to 18, 1908, gage heights were affected by ice jam below station.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Faith Creek for 1907-8 and 1910-1912—Continued.

Day.	May.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1						140	2.4	270
2						140	2.5	320
3						125	2.9	530
4						125	2.7	420
5						102		370
6						102	2.5	320
7						100	2.4	270
8						100	2.3	225
9						102	2.3	225
10						102	2.3	225
11	4.17	430				100	2.2	185
12	3.76	470				95	2.1	150
13	3.45	340	2.1	150		95	2.1	150
14	3.45	340	2.1	150		102	2.1	150
15	3.47	350	1.9	102		102	2.1	150
16	3.54	380	2.1	150		114	2.2	185
17	3.51	370	1.9	102	2.0	126	2.2	185
18	3.42	320	2.0	126	2.1	150	2.1	150
19	3.56	985	1.9	102	2.1	150	2.1	150
20	4.11	1,400	1.9	102	2.2	185	2.1	150
21	4.15	1,430	1.8	82	2.4	270	2.0	126
22			1.8	82	2.4	270	2.0	126
23			1.9	102	2.3	225	2.0	126
24			2.0	126	2.2	185	2.1	150
25			2.0	126	2.0	126	2.3	225
26			2.0	126	2.0	126	2.2	185
27				150	2.0	126	2.1	150
28				175	2.1	150	2.1	150
29				200	2.1	150	2.0	126
30				180	2.1	150	(a)	102
31				150	2.0	126		
Mean discharge		619		131		137		208
Second-feet per square mile		4.69		0.992		1.04		1.58
Run-off (depth in inches on drainage area)		1.92		0.70		1.20		1.76
Maximum		1,430		200		270		530
Minimum		320		82		95		102
Accuracy		C		A		A		A

[a] River frozen over after Sept. 30.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Faith Creek for 1907–8 and 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.										
1			4.26	639	3.08	109	2.98	92	3.24	146
2			4.25	632	3.07	108	2.91	80	3.23	144
3			4.27	646	2.92	81	2.85	70	3.22	141
4			4.16	569	2.82	65	2.82	65	3.33	172
5			4.32	683	2.90	78	2.80	62	3.62	276
6			3.76	339	2.84	68	2.80	62	3.82	368
7			3.55	249	2.80	62	2.78	60	3.78	348
8			3.48	223	2.78	60	2.76	58	3.71	315
9			3.70	310	2.78	60	2.75	56	3.63	281
10			5.74	2,000	2.76	58	2.74	55	3.53	241
11			4.75	1,030	2.75	56	2.74	55	3.45	212
12			4.06	502	2.74	55	2.73	54	3.37	185
13			3.68	302	2.73	54	2.72	53	3.30	162
14			3.48	223	2.72	53	2.70	51	3.34	175
15			3.36	182	2.71	52	2.68	49	3.94	430
16			3.42	202	2.71	52	2.70	51	3.70	310
17			3.43	206	2.70	51	2.84	68	3.66	293
18			3.23	144	2.70	51	4.02	477	3.60	268
19			3.25	149	2.68	49	4.72	1,010	3.52	238
20			3.28	157	2.67	48	4.60	907	3.46	216
21			3.36	182	2.72	53	4.02	477	3.44	209
22			3.76	339	3.02	99	3.54	245	3.42	202
23			3.47	220	3.62	276	3.34	175	3.36	182
24			3.42	202	3.66	293	3.42	202	3.27	154
25	4.32	683	3.35	178	3.16	127	3.58	260	3.24	146
26	3.74	329	3.33	172	3.04	102	3.62	276		
27	3.72	320	3.42	202	2.98	92	3.58	260		
28	3.78	348	3.28	157	2.88	75	3.52	238		
29	4.02	477	3.22	141	2.85	70	3.44	209		
30	4.12	542	3.12	118	3.06	106	3.34	175		
31	4.22	610			3.06	106	3.28	157		
Mean discharge		473		377		86.1		197		233
Second-feet per square mile		3.58		2.86		0.652		1.49		1.77
Run-off (depth in inches on drainage area)		0.93		3.19		0.75		1.72		1.65
Maximum		683		2,000		293		1,010		430
Minimum		320		118		48		49		141
Accuracy		A		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River, below Faith Creek for 1907-8 and 1910-1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.										
1			5.10	795	4.15	250	3.20	28	3.65	90
2			4.70	518	4.25	290	3.20	28	3.80	125
3			4.85	612	4.35	334	3.20	28	3.75	113
4			4.90	645	4.08	226	3.15	24	3.75	113
5			4.70	518	4.12	239	3.15	24	3.70	101
6			5.15	836	4.12	239	3.15	24	3.68	97
7			4.85	612	4.10	232	3.15	24	3.65	90
8			4.55	434	3.80	140	3.15	24	3.65	90
9			4.40	357	3.68	109	3.18	26	3.60	80
10			4.30	311	3.58	87	3.30	40	3.60	80
11			4.25	290	3.48	68	3.65	90	3.60	80
12			4.00	200	3.58	87	3.55	70	3.60	80
13			4.60	460	3.52	75	3.45	53	3.58	76
14			4.75	549	3.48	68	3.48	58	3.55	70
15			4.85	612	3.42	57	5.70	1,280	3.50	61
16			5.02	732	3.42	57	4.62	436	3.55	70
17			5.05	756	3.42	57	4.62	436	3.55	70
18			4.55	434	3.42	57	4.40	327	3.50	61
19			4.80	580	3.40	54	4.15	232	3.50	61
20			4.65	489	3.32	43	3.98	177	3.45	53
21			4.58	450	3.30	40	3.88	147	3.50	61
22			4.35	334	3.28	38	3.80	125	3.50	61
23			4.35	334	3.25	34	3.75	113	3.50	61
24	4.50	408	4.22	277	3.25	34	3.70	101	3.55	70
25	5.00	716	4.10	232	3.22	30	3.70	101		
26	5.35	1,010	4.00	200	3.25	34	3.65	90		
27	5.25	922	4.00	200	3.25	34	3.65	90		
28	4.75	549	3.90	169	3.22	30	3.65	90		
29	4.95	680	3.80	140	3.20	28	3.60	80		
30	4.65	489	3.85	154	3.20	28	3.60	80		
31	5.05	756			3.20	28	3.60	80		
Mean discharge		691		441		101		146		79.8
Second-feet per square mile		5.23		3.33		0.765		1.11		0.604
Run-off (depth in inches on drainage area)		1.56		3.72		0.88		1.27		0.54
Maximum		1,010		836		334		1,280		125
Minimum		408		140		28		24		53
Accuracy		B		A		A		A		A

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Faith Creek for 1907–8 and 1910–1912—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1			4.40	660	3.22	106	3.18	97	3.20	101
2			5.40	1,500	3.15	92	3.10	82	3.30	126
3			5.00	1,130	3.18	97	3.10	82	3.35	140
4			4.25	562	3.12	86	3.10	82	3.35	140
5			3.78	301	3.02	71	3.08	79	3.40	155
6			3.62	232	3.00	68	3.05	75	3.38	149
7			3.48	181	2.95	62	3.40	155	3.30	126
8			3.35	140	2.95	62	3.35	140	3.30	126
9			3.45	172	2.92	58	3.28	121	3.30	126
10			3.42	162	2.90	55	3.22	106	3.25	114
11			3.30	126	2.90	55	3.38	149	3.25	114
12			3.65	244	2.92	58	3.50	188	3.20	101
13			4.00	413	2.92	58	3.38	149	3.20	101
14			3.75	288	3.12	86	3.30	126	3.20	101
15	4.50	730	3.60	224	3.05	75	3.28	121	3.32	132
16	4.70	880	3.80	310	2.98	65	3.20	101	3.40	155
17	4.50	730	3.70	265	2.98	65	3.20	101	3.58	217
18	4.30	595	3.55	206	3.00	68	3.18	97	3.68	257
19	4.15	500	4.95	1,080	2.95	62	3.15	92	3.58	217
20	3.92	371	4.10	470	3.02	71	3.12	86	3.88	350
21	3.92	371	3.75	288	3.05	75	3.12	86	3.85	335
22	3.80	310	3.65	244	3.00	68	3.12	86	3.70	265
23	3.90	360	4.90	1,040	3.00	68	3.12	86	3.62	232
24	3.78	301	4.45	695	2.95	62	3.15	92	3.55	206
25	3.55	206	4.40	660	2.92	58	3.18	97	3.50	188
26	3.55	206	4.05	442	3.12	86	3.25	114	3.48	181
27	3.55	206	3.75	288	3.42	162	3.32	132	3.40	155
28	3.92	371	3.55	206	3.65	244	3.30	126	3.40	155
29	4.45	695	3.38	149	3.50	188	3.25	114	3.42	162
30	4.00	413	3.28	121	3.32	132	3.22	106	3.45	172
31	4.20	530			3.25	114	3.20	101		
Mean discharge		457		427		86.4		109		170
Second-feet per square mile		3.46		3.23		0.655		0.826		1.29
Run-off (depth in inches on drainage area)		2.18		3.60		0.76		0.95		1.44
Maximum		880		1,500		244		188		350
Minimum		206		121		55		75		101
Accuracy		B		B		A		A		A

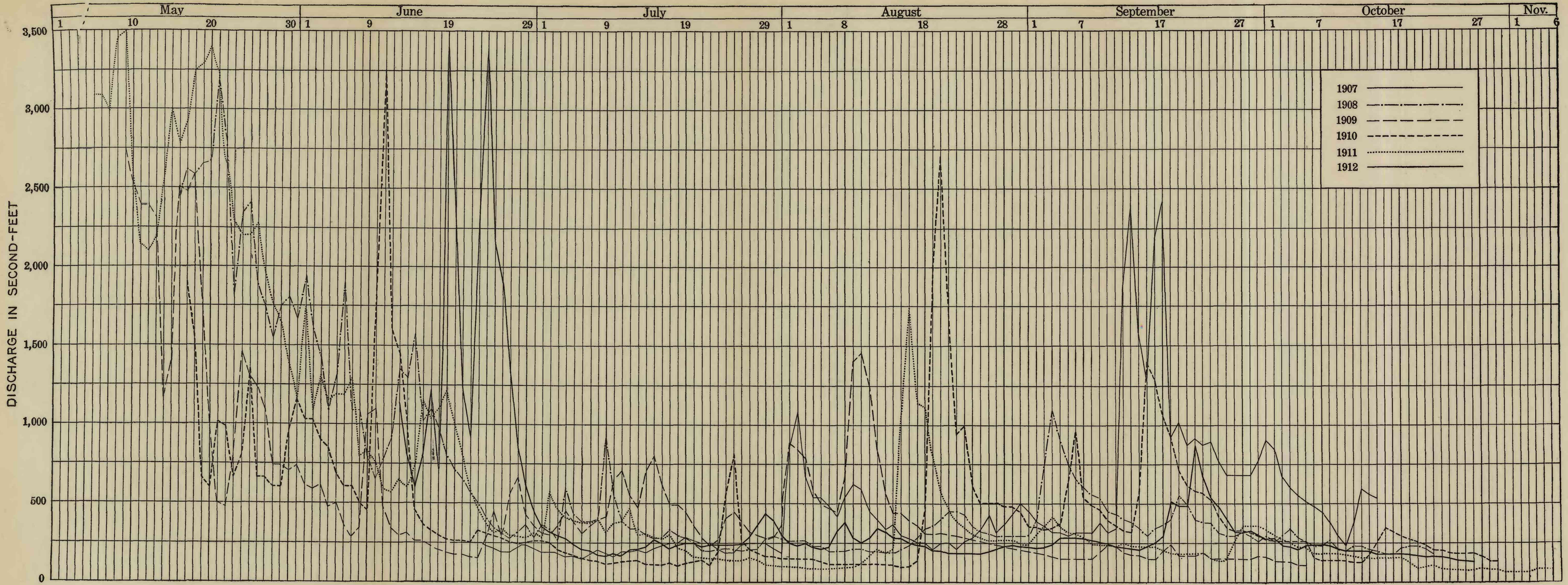
CHATANIKA RIVER BELOW POKER CREEK.

This station was established June 20, 1907. Daily records have been kept for the whole or a part of each season from 1907 to 1912, when ice was not present.

The gage was a vertical staff driven in the left bank of the river about a mile below Poker Creek, opposite the original location of the Cleary Creek Lumber Co.'s sawmill and just below James Fitzsimmons's cabin.

The channel shifted a little during high water. The same rating was used for 1907 and 1908. A different rating has been applied each succeeding year.

Measurements of discharge were made by wading at low water and from a boat at medium and high stages.



HYDROGRAPH SHOWING DAILY DISCHARGE IN SECOND-FEET OF CHATANIKA RIVER BELOW POKER CREEK FROM 1907 TO 1912.

Discharge measurements of Chatanika River below Poker Creek in 1907–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1907.	*Feet.*	*Sec.-ft.*	1909—Contd.	*Feet.*	*Sec.-ft.*	1911—Contd.	*Feet.*	*Sec.-ft.*
June 27	1.08	246	July 17	1.60	435	June 19	3.22	1,360
July 4	.83	178	Aug. 19	1.33	310	July 1	1.64	363
Aug. 9	1.98	669	1910.			8	1.70	399
1908.			Apr. 18	....	*a* 1.91	Aug. 7	.63	68
Aug. 8	.95	207	May 18	3.71	1,700	8	.69	77
14	.90	192	June 30	1.26	266	1912.		
22	1.61	420	Aug. 5	.87	114	June 13	2.88	1,090
1909.			26	1.99	521	20	4.07	2,060
June 29	1.70	469	1911.			July 29	1.89	435
			June 18	2.90	1,070	Aug. 12	1.60	312

a Measurement made through ice covering. Discharge probably about the minimum for the winter.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Poker Creek for 1907–1912.

[Drainage area, 456 square miles. Observer, James Fitzsimmons.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1907. *a*										
1	....	....	0.90	192	2.10	743	1.45	384	2.25	844
2	....	....	.90	192	2.60	1,080	1.40	363	2.00	677
3	....	....	.90	192	2.00	677	1.30	321	1.85	590
4	....	....	.80	167	1.75	530	1.30	321	1.75	530
5	....	....	.80	167	1.75	530	1.25	300	1.70	505
6	....	....	.80	167	1.65	480	1.30	321	1.65	480
7	....	....	.80	167	1.50	405	1.30	321	1.60	455
8	....	....	.95	204	1.75	530	1.30	321	1.45	384
9	....	....	.85	180	1.90	620	1.45	384	1.25	300
10	....	....	.80	167	1.85	590	1.30	321	1.05	232
11	....	....	.90	192	1.60	455	1.35	342	1.45	384
12	....	....	.90	192	1.50	405	3.60	1,860	1.85	590
13	....	....	.95	204	1.35	342	4.45	2,380	1.80	560
14	....	....	.90	192	1.40	363	3.25	1,580	1.75	530
15	....	....	1.00	216	1.25	300	2.85	1,270	....	....
16	....	....	1.05	232	1.20	283	4.00	2,180	....	....
17	....	....	1.10	250	1.10	250	4.30	2,420	....	....
18	....	....	1.10	250	1.10	250	2.35	912	....	....
19	....	....	1.20	283	1.00	216	2.50	1,020	....	....
20	1.10	250	1.15	266	1.10	250	2.30	877	....	....
21	1.10	250	1.10	250	1.10	250	2.35	912	....	....
22	1.10	250	1.10	250	1.00	216	2.30	877	....	....
23	1.10	250	.95	204	1.15	266	2.25	844	....	....
24	1.05	232	.90	192	1.20	283	2.15	776	....	....
25	1.00	216	.90	192	1.35	342	2.00	677	....	....
26	.90	192	1.05	232	1.55	430	2.00	677	....	....
27	.90	192	1.10	250	1.30	321	2.00	677	....	....
28	1.00	216	1.10	250	1.40	363	2.00	677	....	....
29	1.10	250	1.10	250	1.55	430	2.15	776	....	....
30	1.00	216	1.00	216	1.70	505	2.35	912	....	....
31	....	....	.90	192	1.60	455	....	....	....	....
Mean discharge	....	228	....	211	....	425	....	867	....	506
Second-feet per square mile	....	0.500	....	0.463	....	0.932	....	1.90	....	1.11
Run-off (depth in inches on drainage area)	....	0.20	....	0.53	....	1.07	....	2.19	....	0.68
Maximum	....	250	....	283	....	1,080	....	2,420	....	844
Minimum	....	192	....	167	....	216	....	300	....	232
Accuracy	....	A	....	A	....	A	....	B	....	A

a These discharges are well defined below 1,000 second-feet. The river was frozen over after Oct. 14, 1907.

Daily gage height, in feet, and discharge, in second feet, of Chatanika River below Poker Creek in 1907–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.[a]												
1			3.70	1,940	1.40	363	1.15	266	1.30	321	1.15	266
2			3.30	1,620	1.35	342	1.15	266	1.45	384	1.25	300
3			3.05	1,420	1.15	266	1.15	266	2.10	743	1.35	342
4			2.60	1,080	1.85	590	1.05	232	2.60	1,080	1.20	283
5			2.90	1,310	1.55	430	1.05	232	2.35	912	1.15	266
6			3.65	1,900	1.45	384	.95	204	2.10	743	1.05	232
7			2.60	1,080	1.45	384	.95	204	1.95	650	1.05	232
8			2.60	1,080	1.50	405	.95	204	1.80	560	1.15	266
9			2.20	810	2.35	912	1.00	216	1.75	530	1.00	216
10			1.95	650	1.80	560	1.00	216	1.60	455	.95	204
11			2.15	776	1.45	384	.95	204	1.55	430	1.05	232
12			2.35	912	1.35	342	.95	204	1.50	405	1.05	232
13			2.95	1,350	1.35	342	.90	192	1.45	384	1.00	216
14			2.90	1,310	1.25	300	.90	192	1.35	342	.95	204
15			3.25	1,580	1.20	283	.95	204	1.25	300	.85	179
16	4.35	2,460	2.50	1,020	1.20	283	1.05	232	1.35	342	.85	179
17	4.55	2,620	2.65	1,120	1.35	342	1.20	283	1.40	363	1.00	216
18	4.50	2,580	2.45	980	1.25	300	1.35	342	1.50	405	1.05	232
19	4.60	2,660	2.20	810	1.20	283	1.40	363	1.80	560	1.05	232
20	4.60	2,660	2.05	710	1.10	250	1.50	405	1.70	505	1.00	216
21	5.25	3,180	1.95	650	.95	204	1.60	455	1.50	405	.85	179
22	4.75	2,780	1.80	560	.95	204	1.60	455	1.45	384		
23	3.55	1,820	1.60	455	.95	204	1.55	430	1.45	384		
24	4.20	2,340	1.50	405	1.00	216	1.40	363	1.30	321		
25	4.30	2,420	1.35	342	.95	204	1.35	342	1.25	300		
26	3.65	1,900	1.30	321	.95	204	1.30	321	1.25	300		
27	3.45	1,740	1.20	283	.95	204	1.25	300	1.30	321		
28	3.20	1,540	1.30	321	1.00	216	1.25	300	1.25	300		
29	3.45	1,740	1.40	363	1.20	283	1.25	300	1.15	266		
30	3.55	1,820	1.20	283	1.25	300	1.25	300	1.25	300		
31	3.35	1,660			1.20	283	1.25	300				
Mean discharge		2,240		915		331		284		456		234
Second-feet per square mile		4.91		2.01		0.726		0.623		1.00		0.513
Run-off (depth in inches on drainage area)		2.92		2.24		0.84		0.72		1.12		0.40
Maximum		3,180		1,940		912		455		1,080		342
Minimum		1,540		283		204		192		266		179
Accuracy		C		B		A		A		A		A

[a] Discharge curve well defined below 800 second-feet. Ice broke Apr. 29; river cleared of ice May 3; river frozen over after Oct. 21, 1908.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Poker Creek for 1907–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.[a]												
1			1.95	612	1.35	319	2.35	852		168	0.60	110
2			1.90	583	1.30	300	2.30	820		157	.60	110
3			1.95	612	1.45	359	2.20	760		146	.60	110
4			1.70	474	1.65	449	1.90	583		135	.50	92
5			1.75	501	1.45	359	1.70	474	0.70	130	.50	92
6			1.45	359	1.25	283	1.65	449	.70	130		
7			1.25	283	1.45	359	1.60	424	.70	130		
8			1.40	338	1.50	380	2.00	640	.70	130		
9	4.85	2,750	2.65	1,060	1.55	402	3.10	1,380	.90	176		
10	4.65	2,590	2.70	1,090	2.00	640	3.20	1,450	1.05	219		
11	4.40	2,390	1.70	474	2.25	740	2.90	1,230	1.00	204		
12	4.40	2,390	1.40	338	1.80	428	2.30	820	.90	176		
13	4.30	2,310	1.30	300	1.65	449	1.85	556	.80	152		
14	2.80	1,160	1.35	319	2.10	700	1.60	424	.80	152		
15	3.15	1,410	1.20	266	2.25	790	1.60	424	.70	130		
16	4.55	2,510	1.20	266	1.90	583	1.45	359	.70	130		
17	4.50	2,470	1.10	234	1.70	474	1.40	338	.85	164		
18	4.65	2,590	1.00	204	1.70	474	1.30	300	1.05	219		
19	3.60	1,750	.95	190	1.60	424	1.33	311	.80	152		
20	2.55	985	.90	176	1.35	319		300	.80	152		
21	1.75	501	.90	176	1.15	250		289	.80	152		
22	1.70	474	.85	164	1.05	219		278	.85	164		
23	2.25	790	.80	152	1.10	234		267	.70	130		
24	3.20	1,450	1.20	266	1.55	402		256	.70	130		
25	3.00	1,300	1.65	449	1.60	424		245	.70	130		
26	2.90	1,230	1.30	300	1.45	359		234	.70	130		
27	2.70	1,090	1.85	559	1.30	300		223	.70	130		
28	2.15	730	2.05	670	1.25	283		212	.70	130		
29	2.15	730	1.60	424	1.20	266		201	.80	152		
30	2.10	700	1.45	359	1.20	266		190	.75	141		
31	2.15	730			1.40	338		179				
Mean discharge		1,520		407		410		499		151		103
Accuracy		C		A		A		B		A		A

[a] Water was diverted from the river above the gage by ditch from July 5 to about Oct. 10, 1909. No records are available regarding the amount of this diversion, but it probably varies from 20 to 30 second-feet, which amount should be added to the above discharges to obtain the natural flow of the river. The discharges are fairly well defined below 600 second-feet. Ice raised May 6; went out May 9; river frozen over after Oct. 5, 1909.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Poker Creek for 1907–1912—Continued.

Day.	May.		June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.[a]												
1	......	......	2.80	1,020	1.22	239	0.90	120	1.51	337	1.35	280
2	......	......	2.80	1,020	1.20	233	.90	120	1.48	326	1.30	263
3	......	......	2.60	892	1.20	186	.90	120	1.48	326	1.30	263
4	......	......	2.55	861	1.15	174	.88	116	1.55	352	1.30	263
5	......	......	2.25	682	1.12	166	.85	110	2.19	650	1.28	257
6	......	......	2.10	600	1.02	144	.80	100	2.68	942	.92	160
7	......	......	2.10	600	.98	136	.80	100	1.98	536	.82	138
8	......	......	1.90	500	.92	124	.80	100	1.85	478	.80	134
9	......	......	1.80	456	.88	116	.80	100	1.78	447	.80	134
10	......	......	3.80	1,770	.82	104	.79	98	1.60	372	.79	132
11	......	......	5.65	3,260	.80	100	.78	97	1.50	333	.74	123
12	......	......	3.60	1,610	.82	104	.75	92	1.42	305	.76	126
13	......	......	3.40	1,460	.85	110	.74	90	1.38	291	.98	175
14	......	......	2.80	1,020	.80	100	.72	87	2.00	545	1.28	257
15	......	......	1.80	456	.70	84	.60	70	3.30	1,380	1.55	352
16	......	......	1.60	372	.70	84	.62	73	2.92	1,100	1.48	326
17	3.96	1,900	1.50	333	.80	100	.88	116	2.82	1,030	1.40	298
18	3.54	1,560	1.40	298	.65	77	1.90	430	2.60	892	1.34	277
19	2.20	655	1.35	280	.80	100	4.25	2,000	2.28	699	1.30	263
20	2.10	600	1.30	263	.82	104	4.98	2,690	2.10	600	1.22	239
21	2.80	1,020	1.30	263	.85	110	3.70	1,690	2.02	556	1.10	205
22	2.75	988	1.25	248	.72	87	2.61	898	2.00	545	1.08	200
23	2.20	655	1.45	316	1.22	192	2.75	988	1.96	527	1.00	180
24	2.45	800	1.40	298	2.10	520	2.10	600	1.72	421	1.00	180
25	3.25	1,350	1.30	263	2.60	795	1.85	478	1.55	352	1.00	180
26	2.20	655	1.30	263	1.40	242	1.85	478	1.51	337	1.00	180
27	2.20	655	1.20	233	1.20	186	1.84	474	1.50	333	.95	168
28	2.10	600	1.15	219	1.10	161	1.81	460	1.42	305	.80	134
29	2.10	600	1.15	219	1.02	144	1.80	456	1.40	298	.80	134
30	2.70	955	1.22	239	.98	136	1.72	421	1.40	298	......	......
31	3.00	1,160	......	......	.90	120	1.60	372	......	......	......	......
Mean discharge	......	943	......	678	......	170	......	456	......	530	......	208
Accuracy	......	A	......	B	......	B	......	B	......	A	......	A

[a] Water was diverted from the river above the gage by ditch from about May 15 to Oct. 10, 1910. Estimates of daily discharge of the ditch from June 23 to Sept. 27 are published on p. 292. They should be added to the above discharges to obtain the natural flow of the river. The discharge curve is well defined below 2,000 second-feet. A fish trap below the gage caused backwater effect from July 3 to Aug. 13, 1910. River frozen 10 feet from shore at gage Oct. 30; frozen entirely over after Oct. 30, 1910.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Poker Creek for 1907-1912—Continued.

Day.	May. Gage height.	May. Discharge.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.	October. Gage height.	October. Discharge.	November. Gage height.	November. Discharge.
1911.[a]														
1	......	......	3.77	1,740	1.62	359	0.64	84	1.48	303	1.50	310	0.52	67
2	......	......	2.88	1,080	2.02	546	.62	81	1.52	318	1.42	280	.52	67
3	......	......	3.20	1,310	1.82	447	.57	74	1.72	402	1.32	247	.60	78
4	......	......	2.98	1,150	1.70	393	......	71	1.60	350	1.22	215	.62	81
5	......	......	3.02	1,180	1.62	359	......	68	1.47	299	1.22	215	.62	81
6	5.45	3,080	3.02	1,180	1.62	359	......	68	1.44	288	1.44	192	......	......
7	5.32	2,980	3.18	1,300	1.52	318	[b].62	68	1.34	253	1.12	187	......	......
8	5.92	3,460	2.47	811	1.72	402	.70	77	1.30	240	1.12	187	......	......
9	5.95	3,480	2.50	830	1.47	299	.72	81	1.24	221	1.12	187	......	......
10	4.78	2,540	2.40	766	1.62	359	.84	100	1.22	215	1.08	176	......	......
11	4.28	2,140	2.10	589	1.64	367	1.07	150	1.22	215	1.06	171	......	......
12	4.22	2,100	2.05	562	1.82	447	1.27	200	1.27	231	1.02	161	......	......
13	4.32	2,180	2.20	646	1.40	273	1.10	181	1.24	221	1.02	161	......	......
14	4.78	2,540	2.13	606	1.44	288	1.20	209	1.22	215	1.02	161	......	......
15	5.35	3,000	2.37	748	1.34	253	2.80	1,020	1.20	209	1.02	161	......	......
16	5.08	2,780	3.00	1,160	1.32	247	3.74	1,720	1.14	192	1.02	161	......	......
17	5.25	2,920	2.82	1,040	1.46	295	2.94	1,120	1.10	181	1.02	161	......	......
18	5.67	3,260	2.90	1,090	1.17	201	2.92	1,100	1.07	174	.87	127	......	......
19	5.70	3,280	3.08	1,220	1.07	174	2.42	779	1.07	174	.64	84	......	......
20	5.85	3,400	2.77	1,000	.97	149	2.04	557	1.06	171	.74	101	......	......
21	5.65	3,240	2.44	792	.87	127	1.82	447	1.07	174	.77	107	......	......
22	4.92	2,660	2.07	573	.87	127	1.64	367	1.07	174	.64	84	......	......
23	4.45	2,280	1.82	447	.87	127	1.54	326	1.00	156	.62	81	......	......
24	4.35	2,200	1.62	359	.84	120	1.44	288	.92	138	.62	81	......	......
25	4.35	2,200	1.62	359	.82	116	1.37	263	.87	127	.62	81	......	......
26	4.45	2,280	1.50	310	.82	116	1.32	247	1.34	253	.62	81	......	......
27	4.05	1,960	1.42	280	.82	116	1.32	247	1.52	318	.70	94	......	......
28	3.80	1,760	1.40	273	.87	127	1.32	247	1.62	359	.62	81	......	......
29	3.65	1,650	1.37	263	.84	120	1.30	240	1.62	359	.62	81	......	......
30	3.28	1,370	1.44	288	.74	101	1.22	215	1.57	338	.52	67	......	......
31	2.98	1,150	......	......	.67	89	1.22	215	......	......	.52	67	......	......
Mean discharge	......	2,534	......	798	......	252	......	352	......	242	......	147	......	74.8

[a] Water was diverted from the river above the gage by ditch from about May 20 to Oct. 10, 1911. Five discharge measurements of the ditch, made during the summer, show an average of 22 second-feet, which probably does not vary far from the average diversion for the summer. That amount should be added to the above discharges during the diversion period to obtain the natural flow of the river. The discharges are well defined below 1,500 second-feet.

[b] From Aug. 5 to 14, 1911, a fish trap below the gage caused backwater. During that period the discharges were determined by indirect methods. Ice went out May 6; river frozen over after Nov. 5, 1911.

Daily gage height, in feet, and discharge, in second-feet, of Chatanika River below Poker Creek for 1907–1912—Continued.

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.[a]										
1			2.90	330	2.60	228	2.45	188	2.70	259
2			2.80	293	2.55	214	2.50	200	2.65	244
3			2.75	276	2.60	228	2.55	214	2.60	228
4			2.70	259	2.55	214	2.70	259	2.55	214
5			2.55	214	2.50	200	2.70	259	2.60	228
6			2.45	188	2.50	200	2.70	259	2.60	228
7			2.40	176	2.85	312	2.70	259	2.60	228
8			2.30	153	3.00	372	2.60	228	2.60	228
9			2.30	153	2.70	259	2.60	228	2.55	214
10			2.30	153	2.60	228	2.55	214	2.50	200
11			2.30	153	2.70	259	2.55	214	2.50	200
12			2.40	176	2.90	330	2.50	200	2.50	200
13	4.2	1,140	2.40	176	2.85	312	2.50	200	2.50	200
14	3.75	815	2.50	200	2.70	259	2.45	188	2.40	176
15	3.40	585	2.65	244	2.70	259	2.50	200	2.40	176
16	3.75	815	2.60	228	2.60	228	2.60	228	2.40	176
17	4.3	1,220	2.50	200	2.55	214	2.80	293	2.40	176
18	3.6	715	2.55	214	2.50	200	3.25	498	2.40	176
19	6.8	3,450	2.60	228	2.40	176	3.20	470	2.40	176
20	5.9	2,580	2.60	228	2.40	176	3.20	470	2.35	164
21	4.3	1,220	2.70	259	2.35	164	3.80	850	2.35	164
22	3.85	885	2.60	228	2.35	164	3.50	650	2.35	164
23	5.9	2,580	2.55	214	2.30	153	3.25	498	2.30	153
24	6.7	3,350	2.55	214	2.30	153	3.20	470	2.20	132
25	5.4	2,130	2.55	214	2.30	153	3.00	372	2.20	132
26	5.0	1,780	2.55	214	2.40	176	2.85	312	2.20	132
27	4.4	1,300	2.70	259	2.50	200	2.80	293		
28	3.8	850	2.95	351	2.55	214	2.80	293		
29	3.40	585	3.10	419	2.55	214	2.75	276		
30	3.10	419	3.00	372	2.50	200	2.70	259		
31			2.75	276	2.50	200				
Mean discharge.		1,468		234		221		318		191
Accuracy		B		A		A		A		A

[a] A ditch diverted water from the river above the gage from about May 15 to Sept. 30, 1912. The mean of five discharge measurements made during the summer was 26 second-feet. That was probably about the average diversion for the season and should be added to the above discharges to obtain the natural flow of the river. The discharges are well defined below 1,200 second-feet. Ice formed 3 feet from shore at gage Oct. 18; river frozen over Oct. 27, 1912.

CHATANIKA DITCH NEAR OUTLET.

The Chatanika ditch was constructed during the spring and summer of 1909 and put into use July 5, 1909. It diverts water from Chatanika River above Pilot Creek and passes along the south side of the valley for about 5 miles to the town of Chatanika. It furnishes sluicing water for the mines on lower Cleary Creek and the adjoining Chatanika flats. It has a capacity of about 35 second-feet.

A gage was installed near the outlet on June 24, 1910, and daily records were kept until September 27. Daily discharges are published for that period. The channel shifted a little during the summer and backwater on the gage was affected at times by a waste gate below. No daily records are available for 1909, 1911, or 1912. Estimates of the discharge during those years must depend entirely on miscellaneous measurements.

Discharge measurements of Chatanika ditch near outlet in 1910-1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
May 18	3.18	37	June 19	....	24	June 13	....	21
July 1	3.02	31	30	....	21	14	....	24
Aug. 4	3.10	24	July 1	....	20	20	....	14.5
25	3.12	25	8	....	26	July 29	....	36
			8	....	23	Aug. 11	....	33
			Aug. 7	....	16.8			

Daily gage height, in feet, and discharge, in second-feet, of Chatanika ditch near outlet for 1910.

[Observer, Dan McPherson.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	....	....	3.00	30	3.11	24	3.10	24
2	....	....	3.00	29	3.12	25	3.10	24
3	....	....	2.97	28	3.10	24	3.12	25
4	....	....	....	0	3.10	24	3.11	24
5	....	....	2.90	27	3.09	24	3.10	24
6	....	....	3.02	29	3.12	25	3.12	25
7	....	....	3.01	29	3.10	24	3.12	25
8	....	....	3.05	30	3.13	25	3.10	24
9	....	....	2.98	28	3.15	26	3.10	24
10	....	....	2.97	28	3.12	25	3.12	25
11	....	....	3.02	26	3.13	25	3.12	25
12	....	....	3.02	26	3.12	25	3.12	25
13	....	....	3.01	26	3.08	24	3.10	24
14	....	....	3.08	28	3.10	24	3.12	25
15	....	....	3.04	27	3.12	25	3.15	26
16	....	....	3.02	26	3.13	25	3.12	25
17	....	....	3.05	27	3.14	26	3.14	26
18	....	....	3.04	27	3.13	25	3.12	25
19	....	....	3.05	27	3.11	24	3.08	24
20	....	....	3.10	29	3.14	26	3.12	25
21	....	....	3.10	26	3.12	25	3.12	25
22	....	....	3.06	25	3.12	25	3.10	24
23	3.05	31	3.10	26	3.12	25	3.10	24
24	3.05	31	3.05	24	3.10	24	3.10	24
25	3.05	31	3.12	27	3.12	25	3.10	24
26	3.10	33	3.10	26	3.10	24	3.11	24
27	3.00	30	3.10	26	3.12	25	3.10	24
28	3.05	31	3.08	25	3.10	24	....	....
29	3.10	33	3.09	26	3.10	24	....	....
30	3.05	31	3.06	25	3.11	24	....	....
31	....	....	3.10	26	3.10	24	....	....
Mean discharge	....	31	....	26	....	25	....	25
Accuracy	....	C	....	C	....	C	....	C

NOTE.—Rating curve poorly defined. Shifting channel from July 2-31. Discharges applied indirectly during that period.

SMITH CREEK ABOVE POOL CREEK.

A gage was installed on Smith Creek, about 100 feet above Pool Creek, on June 16, 1911, and daily records were kept until September 16. The relation between gage height and discharge probably changed somewhat during the summer, but the discharge measurements are insufficient to determine the amount. These records in comparison with those of Pool Creek are of particular interest in showing the difference in run-off per unit of area that may be expected in adjoining basins.

Discharge measurements of Smith Creek above Pool Creek in 1907–8 and 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1907.	*Feet.*	*Sec.-ft.*	1910.	*Feet.*	*Sec.-ft.*	1911—Contd.	*Feet.*	*Sec.-ft.*
July 14		5.4	July 10		5.4	Aug. 4	2.64	1.9
			Aug. 1		7.3	12	2.70	3.5
1908.								
July 13		11.0	1911.			1912.		
14		9.3	June 16	3.22	17.5	July 23		3.6
Aug. 30		14.2	July 15	2.78	3.8			
Sept. 1		20.5						

Daily gage height, in feet, and discharge, in second-feet, of Smith Creek above Pool Creek for 1911.

[Drainage area, 17.0 square miles. Observer, George Loper.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.20	16.8	2.65	2.1	2.85	6.2
2			3.20	16.8	2.65	2.1	2.90	7.5
3			3.50	28	2.60	1.4	2.85	6.2
4			3.40	24	2.65	2.1	2.85	6.2
5			3.50	28	2.65	2.1	2.85	6.2
6			3.25	18.6	2.65	2.1	2.85	6.2
7			3.40	24	2.65	2.1	2.85	6.2
8			3.20	16.8	2.65	2.1	2.85	6.2
9			2.95	8.9	2.65	2.1	2.85	6.2
10			2.85	6.2	2.70	2.8	2.80	4.9
11			2.85	6.2	2.70	2.8	2.80	4.9
12			2.85	6.2	2.70	2.8	2.80	4.9
13			2.80	4.9	2.70	2.8	2.75	3.8
14			2.80	4.9	2.75	3.8	2.70	2.8
15			2.80	4.9	4.05	50	2.80	4.9
16	3.20	16.8	2.80	4.9	3.45	26	2.80	4.9
17	3.40	24	2.75	3.8	3.50	28		
18	3.20	16.8	2.75	3.8	3.20	16.8		
19	3.20	16.8	2.75	3.8	3.10	13.5		
20	3.10	13.5	2.75	3.8	3.00	10.3		
21	3.10	13.5	2.70	2.8	2.95	8.9		
22	3.00	10.3	2.70	2.8	2.95	8.9		
23	2.90	7.5	2.70	2.8	2.90	7.5		
24	2.95	8.9	2.70	2.8	2.85	6.2		
25	2.90	7.5	2.70	2.8	2.85	6.2		
26	2.85	6.2	2.70	2.8	2.80	4.9		
27	2.80	4.9	2.65	2.1	2.85	6.2		
28	2.80	4.9	2.65	2.1	2.80	4.9		
29	2.80	4.9	2.65	2.1	2.80	4.9		
30	3.05	11.9	2.65	2.1	2.80	4.9		
31			2.65	2.1	2.80	4.9		
Mean discharge		11.2		8.47		7.94		5.51
Second-feet per square mile		0.659		0.498		0.467		0.324
Run-off (depth in inches on drainage area)		0.37		0.57		0.54		0.20
Maximum		24		28		50		7.5
Minimum		4.9		2.1		1.4		2.8
Accuracy		C		C		C		C

POOL CREEK AT MOUTH.

This station was established June 16, 1911. The gage was first installed about 50 feet above Smith Creek and daily records were kept until July 5, when the gage was taken out by high water. It was replaced July 15 about 100 feet above its first location. The gage heights at the different sections are not directly comparable.

Discharge measurements of Pool Creek at mouth in 1907–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1907.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*
July 14		2.4	June 27		32	June 16	2.77	36
			Aug. 16		10.6	July 15	2.76	5.8
1908.						Aug. 4	2.60	1.5
July 12		15.4	1910.			12	2.63	2.2
13		11.0	July 10		4.8			
14		12.3	Aug. 1		8.8	1912.		
						July 23		5.9

Daily gage height, in feet, and discharge, in second-feet, of Pool Creek at mouth for 1911.

[Drainage area, 14 square miles. Observer, George Loper.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.70	32	2.60	1.5	2.80	7.2
2			2.80	38	2.60	1.5	2.85	9.0
3			2.80	38	2.60	1.5	2.80	7.2
4			2.70	32	2.60	1.5	2.80	7.2
5			2.90	45	2.60	1.5	2.75	5.6
6				32	2.60	1.5	2.85	9.0
7				45	2.60	1.5	2.85	9.0
8				32	2.60	1.5	2.80	7.2
9				18	2.60	1.5	2.80	7.2
10				15	2.65	2.8	2.75	5.6
11				9	2.65	2.8	2.75	5.6
12				8	2.65	2.8	2.75	5.6
13				7	2.65	2.8	2.70	4.0
14				6	2.70	4.0	2.70	4.0
15			2.75	5.6	4.00	77	2.80	7.2
16	2.75	35	2.70	4.0	3.40	38	2.80	7.2
17	2.80	38	2.70	4.0	3.45	41		
18	2.70	32	2.70	4.0	3.15	23		
19	2.70	32	2.70	4.0	3.05	17.6		
20	2.60	26	2.70	4.0	2.95	13.1		
21	2.50	20	2.70	4.0	2.90	10.9		
22	2.40	15.4	2.70	4.0	2.90	10.9		
23	2.50	20	2.65	2.8	2.85	9.0		
24	2.50	20	2.65	2.8	2.80	7.2		
25	2.45	17.7	2.65	2.8	2.80	7.2		
26	2.50	20	2.65	2.8	2.75	5.6		
27	2.45	17.7	2.60	1.5	2.80	7.2		
28	2.40	15.4	2.60	1.5	2.80	7.2		
29	2.40	15.4	2.60	1.5	2.80	7.2		
30	2.60	26	2.60	1.5	2.80	7.2		
31			2.60	1.5	2.80	7.2		
Mean discharge		23.4		13.2		10.5		6.74
Second-feet per square mile		1.67		0.943		0.750		0.481
Run-off (depth in inches on drainage area)		0.93		1.09		0.86		0.29
Maximum		38		45		77		9.0
Minimum		15.4		1.5		1.5		4.0
Accuracy		D		C		B		A

NOTE.—Discharges from June 16 to July 5 are based on daily gage readings and one discharge measurement and adjusted by comparison with records in adjacent basins. They are therefore only approximate. The discharge rating curve for the period from July 15 to September 16 is well defined below 10 second-feet The discharges from July 6 to 14 were determined by comparative records.

FAITH CREEK AT MOUTH.

A gaging weir was established on Faith Creek at its mouth June 20, 1907, by the Chatanika Ditch Co., and records were kept until September 4, 1907.

On June 16, 1911, a gage was installed near the original location of the weir and gage readings were taken twice a day during a part of the open season of 1911 and 1912. The datum of the gage remained constant.

The conditions at the station were favorable for accuracy, and the records for all discharges below 400 second-feet should be excellent.

Discharge measurements of Faith Creek at mouth in 1908–9 and 1911–12.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909—Contd.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
July 12	....	67	Aug. 17	....	88	June 10	2.82	70
13	....	78				26	3.17	160
14	....	68	1911.			July 23	2.59	44
			June 16	3.70	314	Aug. 16	2.70	56
1909.			July 14	2.59	35			
June 6	....	151	Aug. 4	2.32	15.2			
26	....	148	12	2.68	48			

Daily discharge, in second-feet, of Faith Creek near mouth for 1907.

[Elevation, 1,375 feet; drainage area, 51 square miles.]

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	....	32.6	36.4	59.0	21	44.7	38.6	26.9	....
2	....	28.5	41.1	52.5	22	42.8	31.4	44.2	....
3	....	26.4	35.9	50.2	23	39.3	25.5	39.4	....
4	....	24.8	34.7	66.4	24	38.8	28.8	49.8	....
5	....	22.1	42.5	....	25	35.3	26.4	62.8	....
6	....	21.6	40.6	....	26	36.5	61.0	82.6	....
7	....	22.0	87.4	....	27	34.4	42.0	69.3	....
8	....	20.8	62.7	....	28	45.9	28.4	62.6	....
9	....	20.1	52.4	....	29	43.6	30.6	70.5	....
10	....	19.2	44.2	....	30	36.8	26.7	72.5	....
					31	....	25.0	67.8	....
11	....	21.0	39.0	....					
12	....	20.5	35.0	....					
13	....	20.1	42.8	....	Mean discharge	40.5	29.2	47.5	....
14	....	21.0	35.0	....					
15	....	20.9	33.6	....	Second-feet per square mile	0.795	0.572	0.932	....
16	....	21.7	34.4	....					
17	....	35.3	30.8	....	Run-off (depth in inches on drainage area)	0.32	0.66	1.07	....
18	....	35.0	30.6	....					
19	....	62.5	28.5	....					
20	44.7	43.9	27.8	....					

NOTE.—These discharges were measured by weir and were furnished by the Chatanika Ditch Co.

Daily gage height, in feet, and discharge, in second-feet, of Faith Creek at mouth for 1911-12.

[Drainage area, 51 square miles. Observer, George Loper.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1911.								
1			3.20	139	2.35	17.0	2.62	39
2			3.10	115	2.35	17.0	2.70	49
3			3.30	167	2.35	17.0	2.65	43
4			3.05	105	2.32	15.2	2.65	43
5			2.92	81	2.30	14.0	2.60	37
6			2.88	74	2.30	14.0	2.65	43
7			2.92	81	2.30	14.0	2.65	43
8			2.82	65	2.30	14.0	2.65	43
9			2.78	59	2.30	14.0	2.60	37
10			2.68	47	2.40	20	2.60	37
11			2.60	37	2.80	62	2.60	37
12			2.65	43	2.70	49	2.60	37
13			2.62	39	2.60	37	2.58	35
14			2.58	35	2.62	39	2.55	32
15			2.55	32	4.60	750	2.55	32
16	3.95	422	2.58	35	3.52	243	2.55	32
17	4.00	444	2.58	35	3.52	243	2.55	32
18	3.70	313	2.58	35	3.25	153	2.52	30
19	3.80	355	2.55	32	3.02	99	2.50	28
20	3.70	313	2.50	28	2.92	81	2.50	28
21	3.65	293	2.48	26	2.82	65	2.50	28
22	3.45	218	2.45	24	2.75	56	2.50	28
23	3.40	200	2.45	24	2.72	52	2.52	30
24	3.30	167	2.42	22	2.70	49	2.55	32
25	3.20	139	2.40	20	2.70	49		
26	3.10	115	2.40	20	2.65	43		
27	3.12	120	2.40	20	2.65	43		
28	3.00	95	2.38	18.8	2.65	43		
29	2.90	77	2.35	17.0	2.60	37		
30	2.92	81	2.35	17.0	2.60	37		
31			2.35	17.0	2.60	37		
Mean discharge		223		48.7		78.2		35.6
Second-feet per square mile		4.37		0.955		1.53		0.698
Run-off (depth in inches on drainage area)		2.44		1.10		1.76		0.61
Maximum		444		167		750		49
Minimum		77		17.0		14.0		28
Accuracy		B		A		B		A

Daily gage height, in feet, and discharge, in second-feet, of Faith Creek at mouth for 1911–12—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.										
1	....	....	3.70	334	2.72	59	2.72	59	2.65	50
2	....	....	4.60	780	2.70	56	2.68	54	2.70	56
3	....	....	4.25	589	2.72	59	2.65	50	2.70	56
4	....	....	3.50	254	2.68	54	2.65	50	2.70	56
5	....	....	3.15	142	2.60	44	2.62	46	2.75	63
6	....	....	3.05	118	2.60	44	2.60	44	2.72	59
7	....	....	2.92	91	2.55	39	2.85	78	2.70	56
8	....	....	2.90	87	2.55	39	2.82	73	2.70	56
9	....	....	2.88	84	2.52	36	2.72	59	2.70	56
10	....	....	2.82	73	2.50	34	2.70	56	2.65	50
11	....	....	2.70	56	2.50	34	2.80	70	2.65	50
12	....	....	3.00	107	2.50	34	2.92	91	2.60	44
13	....	....	3.38	210	2.50	34	2.82	73	2.60	44
14	....	....	3.28	177	2.72	59	2.75	63	2.60	44
15	3.50	254	3.10	129	2.65	50	2.72	59	2.65	50
16	3.70	334	3.32	190	2.58	42	2.70	56	2.70	56
17	3.60	293	3.12	134	2.58	42	2.65	50	2.82	73
18	3.70	334	3.05	118	2.58	42	2.60	44	2.88	84
19	3.48	247	4.15	538	2.52	36	2.60	44	3.02	111
20	3.38	210	3.45	236	2.58	42	2.60	44	3.02	111
21	3.35	200	3.15	142	2.60	44	2.60	44	3.00	107
22	3.25	168	3.10	129	2.60	44	2.60	44	2.90	87
23	3.80	377	3.90	421	2.60	44	2.60	44	2.82	73
24	3.20	154	3.50	254	2.55	39	2.60	44	2.80	70
25	3.12	134	3.48	247	2.52	36	2.62	46	2.80	70
26	3.10	129	3.22	160	2.70	56	2.68	54	2.78	67
27	3.05	118	3.08	125	3.05	118	2.72	59	2.75	63
28	3.38	210	2.95	97	3.28	177	2.70	56	2.75	63
29	3.70	334	2.82	73	3.12	134	2.70	56	2.78	67
30	3.25	168	2.78	67	2.85	78	2.68	54	2.80	70
31	3.60	293	....	....	2.80	70	2.65	50	....	....
Mean discharge	....	233	....	205	....	55.5	....	55.3	....	65.4
Second-feet per square mile	....	4.57	....	4.02	....	1.09	....	1.08	....	1.28
Run-off (depth in inches on drainage area)	....	2.89	....	4.48	....	1.26	....	1.24	....	1.43
Maximum	....	377	....	780	....	177	....	91	....	111
Minimum	....	118	....	56	....	34	....	44	....	44
Accuracy	....	B	....	B	....	A	....	A	....	A

CHARITY CREEK ABOVE HOMESTAKE CREEK.

A gage was installed on Charity Creek a short distance above Homestake Creek on May 26, 1910. The discharge rating curves were not very well defined because of shifting channel and insufficient measurements. The relation of gage height to discharge in 1910 was not the same as in 1912.

Discharge measurements of Charity Creek above Homestake Creek in 1910–1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1910.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
May 26	3.28	22	June 14	....	35	June 9	2.29	8.6
June 11	3.66	41	July 16	....	5.5	July 24	2.06	3.4
July 11	3.11	3.5	Aug. 3	....	2.1	Aug. 16	2.10	4.4
30	3.14	4.6						

Daily gage height, in feet, and discharge, in second-feet, of Charity Creek above Homestake Creek for 1910 and 1912.

[Observers: R. C. Hall, 1910; George Laughlin, 1912.]

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1910.										
1				60				4.0	3.35	14.8
2			3.50	42				3.8		13.3
3			3.75	77				3.6	3.30	11.8
4				44				3.4	3.35	14.8
5				41				3.2		13.5
6				32			3.10	3.2		12.0
7				27				3.2		10.0
8				42				3.2		9.0
9				55			3.10	3.2		8.0
10				77				3.2	3.20	7.0
11			3.66	41	3.11	3.6		3.2		7.0
12						3.5	3.10	3.2		7.0
13						3.4		3.2		7.0
14						3.3		3.1		7.0
15						3.2		3.0	3.20	7.0
16					3.10	3.2		6.0		7.0
17						3.2		9.0		7.0
18						3.2		12.0		7.0
19						3.2	3.40	17.9		7.0
20						3.2				7.0
21					3.15	5.1			3.20	7.0
22						5.1				7.0
23						7.2				7.0
24					3.25	9.4				7.0
25						8.0				7.0
26	3.28	22				7.0				7.0
27	3.28	22				6.0				7.0
28	3.40	32				4.0			3.20	7.0
29	3.52	44			3.10	3.2				
30		60			3.15	5.1				
31	3.75	77			3.13	4.3				
Mean discharge		42.8		48.9		4.64		4.98		8.58
Accuracy		D		D		B		B		B

NOTE.—Discharge on days of missing gage height determined by comparative hydrographs.

Daily gage height, in feet, and discharge, in second-feet, of Charity Creek above Homestake Creek for 1910 and 1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1			2.23	7.0	2.12	4.6	2.12	4.6
2			2.22	6.7	2.11	4.4	2.14	5.0
3			2.21	6.5	2.11	4.4	2.16	5.4
4			2.20	6.2	2.08	3.9	2.17	5.6
5			2.18	5.8	2.07	3.7	2.18	5.8
6			2.16	5.4	2.07	3.7	2.19	6.0
7			2.14	5.0	2.10	4.2	2.16	5.4
8			2.12	4.6	2.10	4.2	2.16	5.4
9	2.30	8.9	2.12	4.6	2.08	3.9	2.14	5.0
10	2.27	8.1	2.11	4.4	2.08	3.9	2.13	4.8
11	2.23	7.0	2.15	5.2	2.22	6.7		
12	2.30	8.9	2.13	4.8	2.15	5.2		
13	2.35	10.8	2.12	4.6	2.13	4.8		
14	2.30	8.9	2.11	4.4	2.12	4.6		
15	2.36	11.1	2.10	4.2	2.11	4.4		
16	2.50	17.6	2.11	4.4	2.11	4.4		
17	2.41	13.1	2.13	4.8	2.10	4.2		
18	2.30	8.9	2.14	5.0	2.09	4.0		
19	2.70	32	2.13	4.8	2.08	3.9		
20	2.48	16.6	2.15	5.2	2.08	3.9		
21	2.40	12.6	2.14	5.0	2.09	4.0		
22	2.38	11.9	2.10	4.2	2.08	3.9		
23	3.00	60	2.11	4.4	2.10	4.2		
24	2.60	24	2.07	3.7	2.10	4.2		
25	2.50	17.6	2.07	3.7	2.09	4.0		
26	2.46	15.6	2.14	5.0	2.11	4.4		
27	2.37	11.5	2.17	5.6	2.10	4.2		
28	2.30	8.9	2.18	5.8	2.11	4.4		
29	2.28	8.4	2.15	5.2	2.10	4.2		
30	2.26	7.8	2.13	4.8	2.10	4.2		
31			2.12	4.6	2.09	4.0		
Mean discharge		15.0		5.02		4.28		5.30
Maximum		60		7.0		6.7		6.0
Minimum		7.0		3.7		3.7		4.6
Accuracy		C		A		A		A

NOTE.—Discharges well defined below 10 second-feet.

HOMESTAKE CREEK AT MOUTH.

This station was established May 26, 1910. The gage was located about 1,000 feet above the mouth of Homestake Creek, at a short distance below a hydraulic plant that was in operation in 1910. The elevation of the gage remained constant. The channel appeared to be permanent. The relation between gage height and discharge might have been slightly affected during low water by deposits of silt from the mine above, but these deposits were removed by even a small increase in discharge, so it is not thought that any material error has been introduced thereby. No hydraulicking was done in 1912, so that the records for that year were not subject to silt effects. The results are believed to be fairly good.

Discharge measurements of Homestake Creek at mouth in 1909-1912.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1909.	*Feet.*	*Sec.-ft.*	1911.	*Feet.*	*Sec.-ft.*	1912.	*Feet.*	*Sec.-ft.*
June 26	....	16.4	June 14	3.44	42	June 9	2.89	6.7
Aug. 16	....	7.7	July 16	2.70	2.4	July 24	2.59	1.3
			Aug. 3	2.55	1.1	Aug. 16	2.76	3.7
1910.								
May 26	3.08	14.2						
June 11	3.24	33						
July 11	2.41	.67						

Daily gage height, in feet, and discharge, in second-feet, of Homestake Creek near mouth for 1910 and 1912.

[Drainage area, 5.6 square miles. Observers: Albert Carruthers, 1910; George Laughlin, 1912.]

Day.	May. Gage height.	May. Discharge.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	Day.	May. Gage height.	May. Discharge.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.
1910.							1910—Con.						
1	......	......	3.34	42	2.70	3.0	21	......	......	3.25	30	......	......
2	......	......	3.29	35	2.68	2.8	22	......	......	3.16	22	......	......
3	......	......	3.34	42	2.64	2.3	23	......	......	2.98	11.0	......	......
4	......	......	3.22	27	2.62	2.0	24	......	......	2.93	9.1	......	......
5	......	......	3.29	35	2.69	2.9	25	......	......	2.81	5.3	......	......
6	......	......	3.14	20	2.67	2.6	26	3.08	16.3	2.78	4.6	......	......
7	......	......	3.10	17.4	......	......	27	3.39	49	2.76	4.2	......	......
8	......	......	3.06	15.2	......	......	28	3.32	39	2.76	4.2	......	......
9	......	......	3.28	34	......	......	29	3.24	29	2.78	4.6	......	......
10	......	......	3.44	56	......	......	30	3.34	42	2.78	4.6	......	......
11	......	......	3.30	36	......	......	31	3.40	50	......	......	......	......
12	......	......	3.10	17.4	......	......	Mean discharge	......	37.6	......	18.2	......	2.93
13	......	......	2.98	11.0	......	......	Second-feet per square mile	......	6.71	......	3.25	......	0.523
14	......	......	2.91	8.4	......	......	Run-off (depth in inches on drainage area)	......	1.50	......	3.63	......	0.12
15	......	......	2.90	8.0	......	......	Maximum	......	50	......	56	......	3.0
16	......	......	2.98	11.0	......	......	Minimum	......	16.3	......	4.2	......	2.0
17	......	......	2.92	8.8	......	......	Accuracy	......	C	......	B	......	B
18	......	......	2.88	7.4	......	......							
19	......	......	2.88	7.4	......	......							
20	......	......	2.89	7.7	......	......							

Daily gage height, in feet, and discharge, in second-feet, of Homestake Creek near mouth for 1910 and 1912—Continued.

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1912.								
1			2.80	4.4	2.70	2.5	2.75	3.4
2			2.76	3.6	2.68	2.3	2.77	3.8
3			2.73	3.1	2.67	2.2	2.80	4.4
4			2.71	2.7	2.66	2.1	2.82	4.9
5			2.70	2.5	2.65	2.0	2.83	5.2
6			2.68	2.3	2.65	2.0	2.82	4.9
7			2.67	2.2	2.68	2.3	2.78	4.0
8			2.65	2.0	2.68	2.3	2.77	3.8
9	2.90	6.9	2.63	1.7	2.67	2.2	2.76	3.6
10	2.86	5.9	2.63	1.7	2.67	2.2	2.75	3.4
11	2.82	4.9	2.65	2.0	2.82	4.9		
12	3.02	11.1	2.63	1.7	2.78	4.0		
13	3.00	10.2	2.62	1.6	2.76	3.6		
14	2.94	8.2	2.62	1.6	2.74	3.3		
15	2.98	9.5	2.62	1.6	2.74	3.3		
16	3.00	10.2	2.63	1.7	2.76	3.6		
17	2.94	8.2	2.64	1.8	2.77	3.8		
18	2.90	6.9	2.65	2.0	2.75	3.4		
19	3.40	44	2.64	1.8	2.73	3.1		
20	3.10	14.8	2.67	2.2	2.72	2.9		
21	3.00	10.2	2.66	2.1	2.74	3.3		
22	3.00	10.2	2.62	1.6	2.72	2.9		
23	3.50	58	2.63	1.7	2.74	3.3		
24	3.25	27	2.59	1.3	2.74	3.3		
25	3.11	15.5	2.59	1.3	2.72	2.9		
26	3.02	11.1	2.68	2.3	2.75	3.4		
27	2.94	8.2	2.72	2.9	2.74	3.3		
28	2.90	6.9	2.80	4.4	2.76	3.6		
29	2.84	5.4	2.76	3.6	2.74	3.3		
30	2.82	4.9	2.72	2.9	2.72	2.9		
31			2.70	2.5	2.70	2.5		
Mean discharge		13.6		2.28		2.99		4.14
Second-feet per square mile		2.43		0.407		0.534		0.739
Run-off (depth in inches on drainage area)		1.99		0.47		0.62		0.27
Maximum		58		4.4		4.9		5.2
Minimum		4.9		1.3		2.0		3.4
Accuracy		B		A		A		A

KOKOMO CREEK ABOVE ALDER CREEK.

Daily records of water-surface elevations were kept on Kokomo Creek from July 9 to August 14, 1907, at the crossing of the Fairbanks-Circle winter trail. The discharge rating curve is based on two discharge measurements made in 1907. It is, however, fairly well defined below 30 second-feet. The gage height is the distance from the water surface to a nail in an overhanging tree.

Discharge measurements of Kokomo Creek above Alder Creek in 1907 and 1909–10.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1907.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
July 9	a −3.00	13.9	Aug. 18		12.7
Aug. 14	a −2.70	22.7	1910.		
			Aug. 3		3.8

a Distance from water surface to reference point.

Daily gage height, in feet, and discharge, in second-feet, of Kokomo Creek above Alder Creek for 1907.

[Drainage area, 33 square miles.]

Day.	July.		August.		Day.	July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1			−10.9	233	21	−3.0	14		
2			− 1.2	107	22	−3.1	12		
3			− 2.0	58	23	−3.2	10		
4			− 2.2	46	24	−3.0	14		
5			− 2.4	36	25	−3.1	12		
6			− 2.4	36	26	−3.0	14		
7			− 2.3	41	27	−3.0	14		
8			− 2.4	36	28	−3.0	14		
9	−3.0	14	− 2.0	58	29	−3.1	12		
10	−3.1	12	− 2.2	46	30	−3.2	10		
					31	−3.2	10		
11	−2.6	26	− 2.4	36					
12	−2.8	19	− 2.5	31					
13	−2.8	19	− 2.6	26	Mean discharge		14.6		58.0
14	−2.9	16	− 2.7	22	Second-feet per square mile		0.442		1.76
15	−2.9	16							
16	−2.9	16			Run-off (depth in inches on drainage area)		0.38		0.92
17	−3.0	14							
18	−2.8	19			Maximum		26		233
19	−3.0	14			Minimum		10		22
20	−3.0	14			Accuracy		B		D

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Chatanika River drainage basin from 1907 to 1912:

Miscellaneous measurements in Chatanika River drainage basin, 1907–1912.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 26, 1908	Chatanika River	Tolovana River	Below Murphy Creek.	263	814	0.32
July 13, 1907	McManus Creek	Chatanika River	¾ mile above Montana Creek.	1.8	8	.16
Do	do	do	Below Montana Creek.	3.8	10	.38
Do	do	do	1½ miles below Idaho Creek.	6.5	26	.25
July 12, 1907	do	do	Above Smith Creek	10.2	42.8	.24
July 14, 1907	do	do	do	12.4	42.8	.29
July 14, 1908	do	do	do	36	42.8	.86
June 6, 1909	do	do	do	67	42.8	1.57
June 27, 1909	do	do	do	52	42.8	1.21
Aug. 16, 1909	do	do	do	29	42.8	.68
July 12, 1907	Smith Creek	McManus Creek	Mouth	7.8	34	.23
July 14, 1907	do	do	do	8.7	34	.26
July 12, 1908	do	do	do	33.8	34	.99
July 13, 1908	do	do	do	27.4	34	.81
July 14, 1908	do	do	do	22.7	34	.67
June 6, 1909	do	do	do	26	34	.76
June 27, 1909	do	do	do	54	34	1.59
Aug. 16, 1909	do	do	do	25	34	.73
July 11, 1907	Hope Creek	Faith Creek	2 miles above mouth.	7.7	17.0	.45
June 26, 1909	do	do	Mouth	77	20.3	3.79
Aug. 16, 1909	do	do	do	33	20.3	1.63
July 10, 1910	do	do	do	12.3	20.3	.61
July 31, 1910	do	do	do	23	20.3	1.13
July 16, 1911	do	do	do	10.1	20.3	.50
Aug. 3, 1911	do	do	do	4.5	20.3	.22
June 10, 1912	do	do	do	24	20.3	1.18
July 24, 1912	do	do	do	20	20.3	.99
Aug. 16, 1912	do	do	do	23	20.3	1.13

Miscellaneous measurements in Chatanika River drainage basin, 1907–1912—Continued.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
June 26, 1909	Charity Creek	Faith Creek	Below Homestake Creek.	30		
Aug. 16, 1909	do	do	do	13.7		
July 11, 1907	do	do	Mouth	5.7		
June 26, 1909	do	do	do	37		
Aug. 16, 1909	do	do	do	16.5		
July 10, 1910	Deep Creek	do	do	2.4		
Aug. 16, 1912	do	do	do	7.6		
July 10, 1910	Orphan Boy Creek	do	do	1.4		
July 13, 1908	Sourdough Creek	Chatanika River	do	22.5	16	1.41
Aug. 17, 1909	do	do	do	25	16	1.56
July 14, 1911	do	do	1 mile above mouth	4.5	16	.28
Aug. 2, 1910	First creek below Sourdough Creek from right limit.	do	Mouth	1.5	5.1	.29
Do	Cripple Creek	do	do	2.8	12.3	.23
Aug. 17, 1909	Cassia Creek	do	do	2.6	7.3	.36
Aug. 2, 1910	do	do	do	.72	7.3	.10
July 15, 1908	Flat Creek	do	Below Third Pup	2.8	7.0	.40
Aug. 29, 1908	do	do	do	3.7	7.0	.53
June 5, 1909	do	do	do	5.1	7.0	.74
July 8, 1910	do	do	do	1.1	7.0	.16
Aug. 17, 1909	do	do	Below First Pup	10.0	16.9	.59
Aug. 2, 1910	do	do	do	3.6	16.9	.21
Aug. 3, 1910	Juniper Creek	do	Mouth	2.0	8.7	.23
Aug. 15, 1907	Boston Creek	do	1 mile above mouth	3.9	6.5	.60
Do	McKay Creek	do	do	3.7	6.2	.60
Do	Crooked Creek	do	do	6.3	7.2	.88
Do	Belle Creek	do	do	10.0	11.2	.91
Aug. 9, 1908	do	do	Elevation, 1,200 feet	1.4	3.0	.47
June 21, 1912	Poker Creek	do	Above ditch intake	45	18.1	2.49
Aug. 10, 1907	do	do	do	21	18.1	1.16
Aug. 14, 1908	do	do	do	9.3	18.1	.51
July 9, 1911	do	do	Above Caribou Creek	7.4	24.5	.30
July 27, 1907	do	do	Mouth	22	40	.55
July 30, 1907	do	do	do	23	40	.58
Aug. 9, 1907	do	do	do	37	40	.92
Aug. 10, 1907	do	do	do	38	40	.95
Aug. 5, 1910	do	do	do	8.8	40	.22
Aug. 10, 1907	Caribou Creek	Poker Creek	Above Little Poker Creek.	10.4		
July 9, 1911	do	do	Mouth	3.1	17.7	.18
June 21, 1912	do	do	do	28	17.7	1.58
Aug. 10, 1907	Little Poker Creek	do	do	3.9		
Aug. 14, 1908	Little Poker and Caribou creek ditch.		In flume	6.2		
Aug. 5, 1910	Poker Creek ditch		Outlet	5.3		
July 23, 1908	Cleary Creek	Chatanika River	Above Wolf Creek	1.6	3.4	.47
July 17, 1909	do	do	do	1.9	3.4	.59
Aug. 19, 1909	do	do	do	3.7	3.4	1.09
July 4, 1907	do	do	Near Cleary	2.9		
July 23, 1908	Chatham Creek	do	Mouth	1.3	3.0	.43
July 17, 1909	do	do	do	.55	3.0	.18
Aug. 19, 1909	do	do	do	1.4	3.0	.47
July 23, 1908	Wolf Creek	Cleary Creek	do	.91	3.8	.24
July 17, 1909	do	do	do	.71	3.8	.19
Aug. 19, 1909	do	do	do	1.5	3.8	.39
June 26, 1907	Eldorado Creek	Chatanika River	Elevation, 930 feet	.45	4.0	.11
June 27, 1907	Dome Creek ditch		Claim "No. 2 below"	.84		
July 26, 1908	Murphy Creek	Chatanika River	Above McCloud Creek.	1.7	17.0	.10
Aug. 20, 1908	do	do	do	1.3	17.0	.076

GOLDSTREAM CREEK DRAINAGE BASIN.

DESCRIPTION.

Goldstream Creek flows southwestward in a narrow, winding course between the drainage basin of Chatanika River on the right and those of Little Chena and Tanana rivers on the left, paralleling Chatanika

River, which it enters from the east, and draining the central portion of the Fairbanks mining district. It is about 70 miles long and it drains an area of about 500 square miles. About 40 miles below its source it leaves the dividing ridges and for the remainder of its course to the Chatanika flows in a zigzag channel across the soft, mucky flats northwest of Tanana River. The stream bed is sandy and shifting, and the channel is deeply cut in the alluvial soil that forms the bottom lands.

The dividing ridges rise about 1,000 feet above the stream bed and are well timbered with spruce and birch. On each side of the stream is a narrow lowland, with a gradual slope upward toward the ridges. This lowland is everywhere covered with the common moss, and where the valley widens, in its lower portion, lakes and swamps are numerous. This bottom land was once well covered with timber, but this has been removed to make way for the railroad and mining enterprises. About 12 miles below the source of the river the southern ridge is broken by a low saddle, over which the Tanana Valley Railroad from Fairbanks enters the mining district.

The upper portion of the valley is drained by Pedro and Gilmore creeks, which unite near Gilmore, about 12 miles north of Fairbanks, to form Goldstream Creek.

Goldstream Creek receives numerous small tributaries from both sides. From the right come Fox, Gold Run, Big Eldorado, O'Connor, and Cache creeks; from the left, Engineer, Butter, Spear, Nugget, Straight, and Allen creeks. Prospecting and more or less mining is done on nearly all these creeks. They are from 4 to 12 miles long and drain small areas.

On the upper portion of Goldstream Creek and along Pedro Creek several small ditches have been built to divert water for sluicing. The largest ditch is owned by the Goldstream Ditch Co. and cost about $6,500. It is about 2 miles long and has a fall of about 7 feet to the mile. It diverts water from claim "No. 6 below," along the left bank of Goldstream Creek, and supplies several mines at the rate of $2 per hour per sluice head, which ranges from 60 to 80 miner's inches of water. A measurement made June 28, 1907, in the lower end of a flume near the intake to this ditch gave a discharge of 10.8 second-feet.

GOLDSTREAM CREEK AT CLAIM "NO. 6 BELOW."

A good location for a gaging station could not be found on Goldstream Creek because of the unfavorable condition of the channel and the numerous small ditches that divert the flow. A gage was established, however, near the lower line of claim "No. 6 below," a short distance above the intake of the Goldstream ditch, June 20, 1907, and was read twice each day. The water diverted by a small ditch a short distance above the gaging station is not considered in the table of estimates. Several measurements made in this ditch gave an average discharge of 1.5 second-feet.

Discharge measurements of Goldstream Creek at claim "No. 6 below" in 1907.

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 21	1.00	10.8
28	1.31	21.1

Daily gage height, in feet, and discharge, in second-feet, of Goldstream Creek at claim "No. 6 below" for 1907.

[Drainage area, 28.6 square miles. Observer, John L. Meder.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.30	21	1.55	30	1.25	18.9	1.30	21
2			1.05	12.3	1.60	32	1.20	17.1	1.30	21
3			1.00	10.8	1.30	21	1.20	17.1	1.40	24
4			.95	9.3	1.15	15.4	1.25	18.9	1.30	21
5			.80	4.9	1.10	13.8	1.30	21	1.30	21
6			.75	3.6	1.15	15.4	1.20	17.1	1.30	21
7			1.15	15.4	1.40	24	1.20	17.1	1.20	17.1
8			1.05	12.3	1.45	26	1.15	15.4		
9			1.00	10.8	1.35	22	1.20	17.1		
10			.85	6.4	1.60	32	1.15	15.4		
11			1.60	32	1.45	26	1.35	22		
12			1.55	30	1.15	15.4	1.70	37		
13			1.20	17.1	1.10	13.8	1.70	37		
14			1.10	13.8	1.05	12.3	1.50	28		
15			1.65	34	1.05	12.3	1.50	28		
16			1.50	28	1.10	13.8	1.80	41		
17			1.25	18.9	1.00	10.8	1.55	30		
18			1.15	15.4	1.00	10.8	1.45	26		
19			1.05	12.3	1.00	10.8	1.30	21		
20	1.00	10.8	1.05	12.3	1.10	13.8	1.60	32		
21	1.00	10.8	1.00	10.8	1.25	18.9	1.45	26		
22	.95	9.3	.95	9.3	1.30	21	1.40	24		
23	.80	4.9	.90	7.8	1.30	21	1.55	30		
24	.90	7.8	1.05	12.3	1.30	21	1.45	26		
25	.90	7.8	.95	9.3	1.25	18.9	1.40	24		
26	1.05	12.3	.95	9.3	1.35	22	1.40	24		
27	.85	6.4	.85	6.4	1.30	21	1.30	21		
28	1.30	21	.85	6.4	1.35	22	1.25	18.9		
29	1.55	30	.80	4.9	1.45	26	1.35	22		
30	1.45	26	.80	4.9	1.50	28	1.40	24		
31			.70	2.2	1.50	28				
Mean discharge		13.4		13.0		20.0		23.9		20.9
Accuracy		B		C		C		C		C

NOTE.—These discharges do not include the amount diverted at claim "No. 3 below" by a small ditch, carrying from 1 to 1.5 second-feet. The creek was frozen after Oct. 7.

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in Goldstream Creek drainage basin from 1907 to 1910:

Miscellaneous measurements in Goldstream Creek drainage basin, 1907–1910.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
July 22, 1908	Pedro Creek	Goldstream Creek	Claim "No. 1 above"	3.2	6.3	0.51
June 29, 1910	do	do	Mouth	6.1	14.3	.43
Do	Gilmore Creek	do	do	6.5	10.7	.61
July 6, 1907	Fox Creek	do	1 mile above mouth	2.0	4.1	.49
Aug. 24, 1908	do	do	do	.43	4.1	.10
June 16, 1909	do	do	do	1.2	4.1	.29
Aug. 10, 1910	do	do	Mouth	.45	7.4	.061

BAKER CREEK DRAINAGE BASIN.

DESCRIPTION.

Baker Creek and its tributaries drain a roughly fan-shaped area 542 square miles in extent. The greatest width of this basin from east to west is 37 miles and its greatest width from north to south 21 miles.

The extreme western fork, to which the name Baker Creek is applied, heads near Sullivan Creek, on the southeast slope of Roughtop Mountain, and flows eastward for about 17 miles. It then makes a right-angle turn to the south around the north end of Bean Ridge and follows the ridge closely for about 4 miles, when it crosses the flat and receives from the east its two larger tributaries, Hutlinana and Hutlitakwa creeks, which drain over half its entire basin. It is about 28 miles long and enters the Tanana 70 miles from the Yukon.

The system of main and tributary streams is very asymmetric, about 88 per cent of the area lying on the left side. South of the creek the country rises abruptly to the summit of Bean Ridge and furnishes no tributaries of importance. On the north the valley spreads out into a broad alluvial flat with a very gradual slope until near the head of the tributaries, where it rises abruptly to the summit of the divide.

No pay gravels have yet been found on the main creek, the chief producing creeks being Thanksgiving, Glenn, Eureka, and Pioneer.

The basin as a whole is favored with a relatively abundant and diversified growth of timber. In the upper part this growth is small but has furnished sufficient supply for fuel and cabins; on the flats, particularly in the lower valley of the Hutlinana, there is considerable spruce suitable for milling. Several sawmills have been in operation during the past two or three winters, but their output has been mainly flume lumber. On the slope near Hot Springs there is a heavy growth of birch and poplar.

As above indicated, all tributaries of importance enter from the left. In downstream order they are as follows: North Fork of Baker Creek, Thanksgiving, Omega, Eureka, and Hutlinana creeks.

Allen Creek, which enters North Fork of Baker Creek about 2½ miles above the mouth of New York Creek, is about 8 miles long. It flows southwestward in a winding course between deep-cut mucky banks, splitting at many places into several channels, causing numerous island-like formations. The banks are lined with an almost impenetrable growth of willows. The left slope is rocky and barren and in some places rises almost vertically from 600 to 800 feet above the stream. The right side of the valley, which furnishes the greater part of the run-off, slopes gradually to the summit, which is capped by rocky cliffs. Allen Creek has been considered as a possible auxiliary water supply for the Thanksgiving Creek mines. It was not practicable to attempt to get daily records on Allen Creek. A miscellaneous measurement was made on August 22, 1908, 5 miles above the mouth at an elevation of approximately 900 feet, which would be sufficient for a diversion to connect with the Thanksgiving ditch at the intake on California Creek. A discharge of 2.7 second-feet was obtained, and by comparison with daily records on other streams it does not seem to have been a minimum for the season. The general character of ground over which a ditch would have to be built is not favorable, and probably considerable flume or pipe would have to be used.

New York Creek rises in a rather low saddle opposite the headwaters of Minook Creek and flows southwestward about 10 miles, joining the North Fork of Baker Creek about 3 miles below Allen Creek. California Creek enters New York Creek from the right.

BAKER CREEK AT ROAD CROSSING.

This station was established August 6, 1908, on the left bank of Baker Creek below Eureka Creek, just above the crossing of the Hot Springs-Eureka road. A vertical staff was installed and gage heights were recorded until September 30, 1908, but as no measurements were obtained at the higher stages daily discharges will not be published. This station was reestablished on May 26, 1909, but not enough records were obtained to make estimates of daily flow.

The elevation of Baker Creek at the gaging station is about 350 feet. The mean elevation of the mines is roughly estimated at 800 feet, at an average distance of about 7 miles. The only method by which this water can be conveyed to the mine is by pumping, and it is reported that such a development has been under consideration. It is seen that the water must be raised vertically 450 feet through a horizontal distance of 7 miles. The expense of installing such a high-power pumping plant as would be required in this case, together with the high cost of fuel, would be so heavy a tax that its justification is very doubtful. It would require over 80 horsepower for every second-foot or about 2 horsepower for every miner's inch of water delivered to the mines.

Discharge measurements of Baker Creek at road crossing in 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
Aug. 6	1.00	41	May 26		1,910
23	1.03	44	July 21		27
27	.98	43	24		159
			Sept. 3		54

Daily gage height, in feet, of Baker Creek at road crossing for 1908.

[Drainage area, 232 square miles. Observer, Charles H. Dickson.]

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1		1.08	11	1.00	1.30	21	1.05	1.25
2		1.20	12	1.00	1.22	22	1.05	1.32
3		1.50	13	.95	1.20	23	1.05	1.32
4		1.65	14	.95	1.20	24	1.00	1.30
5		1.48	15	.95	1.15	25	1.00	1.20
6	1.00	1.45	16	.95	1.10	26	1.00	1.18
7	1.00	1.40	17	.95	1.10	27	1.00	1.15
8	1.00	1.40	18	1.00	1.10	28	1.00	1.10
9	1.00	1.40	19	1.05	1.15	29	1.00	1.10
10	1.00	1.38	20	1.05	1.22	30	1.00	1.10
						31	1.00	

NEW YORK CREEK AT DITCH INTAKE.

This station was established June 6, 1908, about 200 feet above the intake of Thanksgiving ditch and about a mile above the mouth of California Creek. The channel below the gage was permanent, and the curve of discharge is well defined for all stages.

Discharge measurements of New York Creek at ditch intake in 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
June 6	0.40	5.3	May 25	0.88	49
8	.34	4.5	July 23	.20	1.8
July 7	.05	[a] .71	Sept. 4	.15	1.8
Aug. 7	.09	1.06			
18	.12	1.36			

[a] Measurement made by A. V. Thorns.

Daily gage height, in feet, and discharge, in second-feet, of New York Creek at ditch intake for 1908–9.

[Drainage area, 4.7 square miles. Observer, Wm. Mosiman.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1			0.05	0.8			0.4	6.0
2			.05	.8			.35	4.8
3			.1	1.0			.50	9.8
4			.05	.8			.35	4.8
5			.05	.8			.3	3.7
6	0.4	6.0	.05	.8				3.0
7	.35	4.8	.05	.8	0.09	1.0	.25	2.9
8	.55	12.8	.05	.8	.1	1.0	.35	4.8
9	.3	3.7	.05	.8	.05	.8	.3	3.7
10	.25	2.9	.15	1.6	.05	.8	.25	2.9
11	.25	2.9	.1	1.0		.8	.2	2.1
12	.25	2.9	.05	.8	.05	.8	.2	2.1
13	.2	2.1	.05	.8		.8	.2	2.1
14	.3	3.7	.05	.8	.05	.8	.2	2.1
15	.4	6.0			.05	.8	.25	2.9
16	.3	3.7			.05	.8	.2	2.1
17	.25	2.9			.05	.8	.25	2.9
18	.25	2.9			.12	1.2	.55	12.8
19	.25	2.9			.25	2.9	.5	9.8
20	.4	6.0			.2	2.1	.45	7.9
21	.3	3.7			.15	1.6		
22	.25	2.9			.15	1.6		
23	.2	2.1			.1	1.0		
24	.2	2.1			.1	1.0		
25	.15	1.6				1.3		
26	.1	1.0			.15	1.6		
27	.1	1.0			.1	1.0		
28	.1	1.0			.1	1.0		
29	.1	1.0			.1	1.0		
30	.05	.8			.1	1.0		
31		.8				3.0		
Mean discharge		3.24		0.89		1.22		4.66
Second-feet per square mile		0.689		0.189		0.260		0.991
Run-off (depth in inches on drainage area)		0.67		0.98		0.24		0.74
Maximum		12.8		1.6		3.0		12.8
Minimum		.8		.8		.8		2.1
Accuracy		A		A		A		A

NOTE.—From July 15 to Aug. 6 the discharge was probably less than 1 second-foot at all times.

Daily gage height, in feet, and discharge, in second-feet, of New York Creek at ditch intake for 1908-9—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.										
1			0.40	6.0	0.10	1.0	0.10	1.0	0.15	1.4
2			.40	6.0	.10	1.0	.10	1.0	.15	1.4
3			.40	6.0	.10	1.0	.20	2.1	.15	1.4
4			.40	6.0	.10	1.0	.32	4.2	.15	1.4
5			.40	6.0	.10	1.0	.55	12.9	.15	1.4
6			.30	3.7	.10	1.0	.48	9.0	.12	1.2
7			.30	3.7	.10	1.0	.40	6.0	.12	1.2
8			.30	3.7	.12	1.2	.40	6.0		
9			.30	3.7	.18	1.8	1.20	100		
10			.20	2.1	.28	3.4	1.08	81		
11			.20	2.1	.22	2.4	.68	23		
12			.22	2.4	.20	2.1	.52	11.0		
13			.25	2.9	.15	1.4	.45	7.9		
14			.22	2.4	.18	1.8	.38	5.5		
15			.20	2.1	.15	1.4	.30	3.7		
16			.20	2.1	.10	1.0	.30	3.7		
17			.20	2.1	.10	1.0	.25	2.9		
18			.18	1.8	.08	.90	.25	2.9		
19			.12	1.2	.05	.75	.25	2.9		
20			.12	1.2	.05	.75	.22	2.4		
21			.10	1.0	.05	.75	.20	2.1		
22			.10	1.0	.04	.70	.20	2.1		
23			.10	1.0	.15	1.4	.25	2.9		
24			.20	2.1	.28	3.4	.22	2.4		
25	0.88	49	.28	3.4	.20	2.1	.20	2.1		
26	.75	31	.20	2.1	.15	1.4	.20	2.1		
27	.65	20	.20	2.1	.15	1.4	.20	2.1		
28	.55	12.9	.15	1.4	.20	2.1	.20	2.1		
29	.52	11.0	.10	1.0	.18	1.8	.18	1.8		
30	.50	9.8	.10	1.0	.15	1.4	.15	1.4		
31	.50	9.8			.12	1.2	.15	1.4		
Mean discharge		20.5		2.78		1.44		9.96		1.34
Second-feet per square mile		4.36		0.591		0.306		2.12		0.285
Run-off (depth in inches on drainage area)		1.14		0.66		0.35		2.44		0.07
Maximum		49		6.0		3.4		100		1.4
Minimum		9.8		1.0		0.70		1.0		1.2
Accuracy		B		A		A		B		A

CALIFORNIA CREEK AT DITCH INTAKE.

This station was established August 7, 1908, about 100 feet above the ditch intake. Below the gage the channel was liable to shift. The gage datum was changed between the end of the 1908 and the beginning of the 1909 records and its permanency at other times is doubtful. The discharge curves for each season are very poorly defined, and the discharge should be accepted as approximate only.

Discharge measurements of California Creek at ditch intake in 1908-9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
Aug. 7	1.00	2.4	July 23	0.80	3.8
18	1.03	2.9	Sept. 4	.40	2.6

Daily gage height, in feet, and discharge, in second-feet, of California Creek at ditch intake for 1908-9.

[Drainage area, 6.7 square miles. Observer, Wm. Mosiman.]

Day.	1908				1909							
	August.		September.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	......	......	1.10	4.2	......	......	0.78	3.7	0.60	3.2	0.40	2.6
2	......	......	1.15	5.2	......	......	.72	3.6	.60	3.2	.40	2.6
3	......	......	1.25	7.5	......	......	.75	3.6	.70	3.5	.38	2.6
4	......	......	1.20	6.3	......	......	.72	3.6	.78	3.7	.40	2.6
5	......	......	1.15	5.2	......	......	.70	3.5	1.02	5.1	.40	2.6
6	......	......	......	4.7	......	......	.70	3.5	.95	4.6	.38	2.6
7	......	......	1.10	4.2	......	......	.65	3.4	.80	3.8	.38	2.6
8	1.00	2.4	1.15	5.7	......	......	.90	4.3	.85	4.0	......	......
9	1.00	2.4	1.10	4.2	......	......	.85	4.0	1.30	8.3	......	......
10	1.00	2.4	1.05	3.2	......	......	.90	4.3	1.18	6.6	......	......
11	......	2.4	1.10	4.2	......	......	.88	4.2	.68	3.4	......	......
12	1.00	2.4	1.05	3.2	......	......	.78	3.7	.70	3.5	......	......
13	......	2.4	1.05	3.2	......	......	.70	3.5	.72	3.6	......	......
14	1.00	2.4	1.10	4.2	......	......	.70	3.5	.70	3.5	......	......
15	1.00	2.4	1.10	4.2	0.95	4.6	.70	3.5	.78	3.7	......	......
16	1.00	2.4	1.05	3.2	.98	4.8	.70	3.5	.68	3.4	......	......
17	1.00	2.4	1.11	4.4	.88	4.2	.70	3.5	.65	3.4	......	......
18	1.03	2.9	1.30	8.7	.90	4.3	.70	3.5	.65	3.4	......	......
19	1.05	3.2	1.30	8.7	.85	4.0	.70	3.5	.60	3.2	......	......
20	1.00	2.4	1.25	7.5	.85	4.0	.70	3.5	.60	3.2	......	......
21	1.00	2.4	......	......	.85	4.0	.65	3.4	.55	3.0	......	......
22	1.00	2.4	......	......	.85	4.0	.60	3.2	.50	2.9	......	......
23	1.00	2.4	......	......	.85	4.0	.75	3.6	.60	3.2	......	......
24	1.00	2.4	......	......	.98	4.8	.88	4.2	.50	2.9	......	......
25	......	2.4	......	......	1.00	4.9	.70	3.5	.50	2.9	......	......
26	1.00	2.4	......	......	.90	4.3	.70	3.5	.45	2.8	......	......
27	1.00	2.4	......	......	.85	4.0	.70	3.5	.45	2.8	......	......
28	1.00	2.4	......	......	.80	3.8	.70	3.5	.45	2.8	......	......
29	1.00	2.4	......	......	.80	3.8	.70	3.5	.40	2.6	......	......
30	1.00	2.4	......	......	.80	3.8	.65	3.4	.40	2.6	......	......
31	......	2.4	......	......	......	......	.62	3.3	.40	2.6	......	......
Mean discharge	......	2.45	......	5.07	......	4.21	......	3.61	......	3.59	......	2.60
Second-feet per square mile	......	0.366	......	0.757	......	0.628	......	0.539	......	0.536	......	0.388
Run-off (depth in inches on drainage area)	......	0.31	......	0.56	......	0.38	......	0.62	......	0.62	......	0.10
Maximum	......	3.2	......	8.7	......	4.9	......	4.3	......	8.3	......	2.6
Minimum	......	2.4	......	3.2	......	3.8	......	3.2	......	2.6	......	2.6
Accuracy	......	D	......	D	......	D	......	D	......	D	......	D

THANKSGIVING DITCH NEAR OUTLET.

This station, which is located about one-fourth mile above the outlet of Thanksgiving ditch, was established June 6, 1908.

The ditch diverts water from California and New York creeks a short distance above their confluence for use at the mines near the head of Thanksgiving Creek. It is about 4 miles long, with a bottom width of 5 feet and a grade of $6\frac{2}{3}$ feet per mile. The conditions at the station were favorable for accuracy and the estimates should represent closely the volume of water delivered for mining purposes.

Discharge measurements of Thanksgiving ditch near outlet in 1908-9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1908—Contd.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
June 6	1.20	11.2	Aug. 7	.60	2.1	May 25	1.03	7.7
8	1.20	10.7	18	.68	2.7	July 23	.85	4.2
July 7	.60	*a* 2.9	29	.60	1.8	Sept. 4	.80	3.0

a Measurement made by A. V. Thorns.

Daily gage height, in feet, and discharge, in second-feet, of Thanksgiving ditch near outlet for 1908-9.

[Observer, Wm. Mosiman.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1908.								
1			0.65	2.4			0.90	4.7
2			.60	2.1			.95	5.4
3			.75	3.2			1.20	10.9
4			.70	2.7			1.10	8.1
5			.60	2.1			1.00	6.2
6	1.20	10.9	.60	2.1				5.4
7	1.05	7.2	.60	2.1	0.60	2.1	.90	4.7
8	1.20	10.9	.65	2.4	.60	2.1	1.05	7.2
9	1.10	8.1	.60	2.1	.55	1.9	.95	5.4
10	1.05	7.2	.70	2.7	.55	1.9	.90	4.7
11	.95	5.4	.65	2.4		1.8	.80	3.6
12	.95	5.4	.65	2.4	.50	1.7	.75	3.2
13	.90	4.7	.60	2.1		1.7	.75	3.2
14	1.10	8.1	.60	2.1	.50	1.7	.80	3.6
15	1.25	13.0			.50	1.7	.85	4.2
16	1.10	8.1			.50	1.7	.80	3.6
17	1.05	7.2			.55	1.9	.85	4.2
18	1.10	8.1				2.8	1.25	13.0
19	1.00	6.2			.80	3.6	1.20	10.9
20	1.10	8.1			.70	2.7	1.15	9.5
21	1.25	13.0			.70	2.7		
22	1.00	6.2			.70	2.7		
23	.90	4.7			.65	2.4		
24	.80	3.6			.65	2.4		
25	.70	2.7				2.4		
26	.70	2.7			.65	2.4		
27	.70	2.7			.60	2.1		
28	.70	2.7			.60	2.1		
29	.70	2.7			.60	2.1		
30	.65	2.4			.60	2.1		
31								
Mean discharge		6.48		2.35		2.20		6.08
Maximum		13.0		3.2		3.6		13.0
Minimum		2.4		2.1		1.7		3.2
Accuracy		B		B		B		B

NOTE.—Discharges from July 15 to Aug. 6 were probably less than 2.1 second-feet at all times.

Daily gage height, in feet, and discharge, in second-feet, of Thanksgiving ditch near outlet for 1908–9—Continued.

Day.	May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.										
1			0.90	4.7	0.72	2.9	0.70	2.7	0.80	3.6
2			.90	4.7	.70	2.7	.75	3.2	.78	3.4
3			.90	4.7	.70	2.7	.90	4.7	.78	3.4
4			.95	5.4	.72	2.9	1.00	6.2	.80	3.6
5			.90	4.7	.70	2.7	1.15	9.5	.80	3.6
6			.85	4.2	.70	2.7	1.02	6.6	.75	3.2
7			.80	3.6	.65	2.4	1.12	8.7	.75	3.2
8			1.05	7.2	.85	4.2	1.12	8.7		
9			.95	5.4	.90	4.7	1.20	10.9		
10			1.00	6.2	1.05	7.2	1.00	6.2		
11			.95	5.4	1.00	6.2	1.00	6.2		
12			.98	5.9	.90	4.7	1.10	8.1		
13			1.00	6.2	.82	3.8	1.12	8.7		
14			.95	5.4	.82	3.8	1.18	10.3		
15			.95	5.4	.78	3.4	1.10	8.1		
16			.95	5.4	.72	2.9	1.08	7.7		
17			.88	4.5	.70	2.7	1.00	6.2		
18			.85	4.2	.68	2.6	1.00	6.2		
19			.82	3.8	.62	2.2	1.00	6.2		
20			.80	3.6	.60	2.1	.92	5.0		
21			.80	3.6	.60	2.1	.90	4.7		
22			.78	3.4	.58	2.0	.90	4.7		
23			.78	3.4	.78	3.4	.95	5.4		
24			.98	5.9	.98	5.9	.90	4.7		
25	1.03	6.8	1.05	7.2	.85	4.2	.90	4.7		
26	.85	4.2	.90	4.7	.80	3.6	.85	4.2		
27	.98	5.9	.85	4.2	.80	3.6	.82	3.8		
28	1.00	6.2	.80	3.6	.85	4.2	.80	3.6		
29	1.02	6.6	.78	3.4	.80	3.6	.80	3.6		
30	1.00	6.2	.78	3.4	.80	3.6	.80	3.6		
31	.98	5.9			.75	3.2	.80	3.6		
Mean discharge		5.97		4.78		3.51		6.02		3.43
Maximum		6.8		7.2		7.2		10.9		3.6
Minimum		4.2		3.4		2.0		2.7		3.2
Accuracy		B		B		B		B		B

CALIFORNIA BRANCH OF THANKSGIVING DITCH NEAR INTAKE.

A gage was placed in the intake flume of California branch of Thanksgiving ditch a short distance from the head on June 6, 1908. Daily records were kept from June 6 to July 14 and from August 7 to September 20. From July 15 to August 6 the discharge was probably less than 2.1 second-feet.

Discharge measurements of California branch of Thanksgiving ditch near intake in 1908.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 6	0.85	5.1	Aug. 7	0.64	2.0
8	1.02	7.9	18	.72	2.5
July 7	.65	*a* 2.1			

a Measurement made by A. V. Thorns.

Daily gage height, in feet, and discharge, in second-feet, of California branch of Thanksgiving ditch near intake for 1908.

[Observer, William Mosiman.]

Day.	June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			0.65	2.1			0.8	3.9
2			.6	1.8			.9	5.5
3			.7	2.6			.85	4.6
4			.65	2.1			1.0	7.5
5			.65	2.1			.9	5.5
6	0.85	4.6	.65	2.1			.85	4.6
7	.8	3.9	.65	2.1	0.65	2.1		4.6
8	1.0	7.5	.6	1.8	.65	2.1	.85	4.6
9	.75	3.2	.65	2.1	.65	2.1	.85	4.6
10	.9	5.5	.7	2.6	.65	2.1	.8	3.9
11	.8	3.9	.65	2.1		2.1	.8	3.9
12	.85	4.6	.65	2.1	.65	2.1	.75	3.2
13	.8	3.9	.65	2.1		2.1	.8	3.9
14	.9	5.5	.65	2.1	.65	2.1	.8	3.9
15	.95	6.4			.65	2.1	.75	3.2
16	.85	4.6			.65	2.1	.8	3.9
17	.85	4.6			.65	2.1	1.0	7.5
18	.85	4.6				2.6	1.0	7.5
19	.8	3.9			.75	3.2	.75	3.2
20	1.3	14.6			.7	2.6	.95	6.4
21	1.0	7.5			.7	2.6		
22	.9	5.5			.7	2.6		
23	.8	3.9			.65	2.1		
24	.8	3.9			.65	2.1		
25	.75	3.2				2.1		
26	.7	2.6			.65	2.1		
27	.7	2.6			.65	2.1		
28	.7	2.6			.65	2.1		
29	.7	2.6			.65	2.1		
30	.65	2.1			.65	2.1		
31						2.1		
Mean discharge		4.71		2.13		2.22		4.80
Maximum		14.6		2.6		3.2		7.5
Minimum		2.1		1.8		2.1		3.2
Accuracy		A		A		A		A

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in Baker Creek drainage basin in 1908:

Miscellaneous measurements in Baker Creek drainage basin in 1908.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 30, 1908.	North Fork of Baker Creek.	Baker Creek	Below Wolverine Creek.	5.2	19.7	0.26
Do	Wolverine Creek	North Fork of Baker Creek.	2 miles above mouth	2.1	6.2	.34
Do	do	do	Mouth	2.6	8.2	.32
Aug. 22, 1908.	Allen Creek	do	5 miles above mouth	2.7	5.9	.46
Do	do	do	1 mile above mouth	4.9	15.3	.32
Do	New York Creek	do	Trail crossing	[a] 1.4	17.3	
Aug. 29, 1908.	Thanksgiving ditch		Below weir near outlet.	1.7		

[a] 1.7 second-feet diverted above point of measurement.

EUREKA CREEK DRAINAGE BASIN.

DESCRIPTION.

Eureka Creek rises in the Minook-Baker divide, just east of Eureka Dome, flows southwestward for about 5 miles, then takes a more southerly course and unites with Baker Creek near where that creek makes its decided turn to the south. The total length of Eureka Creek is about 12 miles. It receives Boston Creek about 5 miles from its source.

Above Boston Creek the valley resembles that of Pioneer Creek. The south side rises abruptly about 600 feet above the stream and furnishes no tributaries, while the north slope is gentle and is cut by several small streams. Below Boston Creek the valley rapidly broadens into Baker Flats, which are covered with a dense growth of willows intermixed with some good-sized spruce, and across which the stream meanders sluggishly through a deep-cut, mucky channel.

The main diggings are near the junction of Boston Creek, although workable gold placers have been found at several points above.

Pioneer Creek heads in the south slope of Elephant Mountain and flows southwestward. It is about 11 miles long and for about 5 miles of its course parallels Eureka Creek, to which it is a tributary about 7 miles from the head.

On the south side, which the creek closely follows, the valley rises almost precipitously about 800 feet above the bed of the stream and is broken only by small gulches. The north side, in contrast, exhibits a very gentle slope, marked by a prominent bench, which is cut at right angles to Pioneer Creek by several small tributaries of similar appearance. There is very little timber in the valley, the supply being barely sufficient for fuel. Most of the diggings are on the north slope. What Cheer Bar, Seattle Bar, and Doric, Boothby, and Joe Bush creeks cover the principal claims.

A ditch 4 miles long diverts water from Pioneer Creek just above Joe Bush Creek and carries it to the What Cheer Bar workings. It has a bottom width of 5 feet and a grade of 5 feet per mile.

Another ditch, 2½ miles long, of the same size and slope, was constructed in 1909 to carry water to the Eureka Creek mines near Boston Creek. The intake is just above Boothby Creek.

PIONEER CREEK AT WHAT CHEER BAR DITCH INTAKE.

This station was established June 7, 1908. The gage was a vertical staff driven into the right bank of the creek about 200 feet above the diversion dam at the What Cheer Bar ditch intake. Different rating curves were used for 1908 and 1909. The permanency of the relation between gage height and discharge is somewhat doubtful, but it is not believed that any large errors have been introduced.

Discharge measurements of Pioneer Creek at What Cheer Bar ditch intake in 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
June 7	0.95	10.8	May 26	2.35	86
21	.65	*a* 4.0	July 22	.35	1.7
Aug. 8	.50	2.6	24	......	7.3
19	.52	2.6	25	4.7	
			Sept. 5	4.7	

a Measurement made by A. V. Thorns.

Daily gage height, in feet, and discharge, in second-feet, of Pioneer Creek at What Cheer Bar ditch intake for 1908–9.

[Drainage area, 8.1 square miles. Observer, ditch walker.]

Day.	June. Gage height.	June. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.	Day.	June. Gage height.	June. Discharge.	August. Gage height.	August. Discharge.	September. Gage height.	September. Discharge.
1908.							1908—Con.						
1	......	......	0.55	2.9	0.70	4.7	21	0.65	4.0	......	2.9	......	......
2	......	......	......	2.9	.67	3.7	22	.65	4.0	......	2.9	......	......
3	......	......	......	2.9	.78	6.2	23	.60	3.4	......	2.8	......	......
4	......	......	......	2.9	.72	4.8	24	.60	3.4	......	2.7	......	......
5	......	......	.55	2.9	......	4.4	25	.60	3.4	......	2.6	......	......
6	......	......	......	2.8	......	4.0	26	......	3.4	......	2.6	......	......
7	0.95	10.8	......	2.7	.63	3.7	27	......	3.4	......	2.6	......	......
8	.85	7.9	.50	2.6	......	3.6	28	......	2.9	0.50	2.6	......	......
9	.80	6.6	......	2.6	......	3.4	29	......	2.9	......	3.1	......	......
10	.80	6.6	......	2.6	......	3.2	30	.55	2.9	......	3.6	......	......
							31	......	......	......	4.1	......	......
11	.75	5.6	......	2.6	......	3.0							
12	.75	5.6	......	2.6	......	2.8	Mean discharge	......	5.44	......	2.84	......	4.18
13	.70	4.7	.50	2.6	.51	2.6							
14	.85	7.9	......	2.7	......	3.0	Second-feet per square mile	......	0.672	......	0.351	......	0.516
15	.95	10.8	......	2.8	.60	3.4							
16	.85	7.9	......	2.9	......	4.2	Run-off (depth in inches on drainage area)	......	0.60	......	0.40	......	0.39
17	.80	6.6	.55	2.9	......	5.0	Maximum	......	10.8	......	4.1	......	6.6
18	.75	5.6	......	2.9	......	5.8	Minimum	......	2.9	......	2.6	......	2.6
19	.75	5.6	......	2.9	.80	6.6	Accuracy	......	B.	......	B.	......	B.
20	.70	4.7	......	2.9	.75	5.6							

NOTE.—The discharge during July probably did not exceed 3 second-feet.

Daily gage height, in feet, and discharge, in second-feet, of Pioneer Creek at What Cheer Bar ditch intake for 1908–9—Continued.

Day.	May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.								
1			0.8	12.3	0.4	3.0	0.45	3.8
2			.7	9.4	.4	3.0	.4	3.0
3			.9	15.2		3.0	.7	9.4
4			.8	12.3		3.0	.9	15.2
5			.8	12.3		3.0	1.5	39
6			.7	9.4		3.0	1.1	22
7			.7	9.4	.4	3.0	.9	15.2
8			.6	7.0	.5	4.7	1.0	18.4
9			.6	7.0	.6	7.0	1.1	22
10			.6	7.0	.5	4.7	1.1	22
11			.5	4.7	.5	4.7	1.4	34
12			.5	4.7	.5	4.7	2.3	83
13			.7	9.4	.4	3.0	1.4	34
14			.6	7.0	.4	3.0	1.2	26
15			.5	4.7	.4	3.0	.9	15.2
16			.5	4.7	.4	3.0	.9	15.2
17			.5	4.7		3.0	.8	12.3
18			.5	4.7		3.0	.75	10.8
19			.5	4.7		3.0	.75	10.8
20			.5	4.7		2.8	.7	9.4
21			.5	4.7		2.6	.65	8.2
22			.5	4.7	.35	2.4	.6	7.0
23			.4	3.0		4.7	.9	15.2
24			.7	9.4	.6	7.0		
25			.6	7.0	.5	4.7		
26	2.25	80	.5	4.7	.5	4.7		
27	1.7	49	.5	4.7	.5	4.7		
28	1.3	30	.4	3.0	.45	3.8		
29	1.1	22	.4	3.0	.45	3.8		
30	1.1	22	.4	3.0	.45	3.8		
31	.9	15.2			.45	3.8		
Mean discharge		36.4		6.75		3.76		19.6
Second-feet per square mile		4.49		0.833		0.440		2.42
Run-off (depth in inches on drainage area)		1.00		0.93		0.51		2.07
Maximum		80		15.2		7.0		83
Minimum		15.2		3.0		2.4		3.0
Accuracy		C		C		C		C

WHAT CHEER BAR DITCH NEAR INTAKE.

A gage was installed in What Cheer Bar ditch just below the intake on June 1, 1909, and daily records were kept until August 23. The rating curve is fairly well developed for all stages.

On June 7, 1908, a gage was installed in the ditch near Seattle Creek, and daily readings were made until June 30, when a break in the ditch destroyed the station and rendered the records valueless, as only one discharge measurement had been made.

Discharge measurements of What Cheer Bar ditch near intake in 1909.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
May 26	[a]2.58	40	July 25	0.50	4.5
July 22	.28	2.0	Sept. 5	[b].68	4.6
24	.68	7.4			

[a] Distance below nail in stump opposite proposed location of gage. Elevation of nail, 4.07 feet above zero of gage.
[b] Backwater caused by temporary obstruction in ditch below gage.

Daily gage height, in feet, and discharge, in second-feet, of What Cheer Bar ditch near intake for 1909.

[Observer, ditch walker.]

Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	0.5	4.2	0.4	3.0	0.45	3.6
2	.5	4.2	.4	3.0	.4	3.0
3	.9	13.3	......	3.0	.65	6.8
4	.8	10.4	......	2.9	.7	7.8
5	.8	10.4	......	2.8	1.2	25
6	.7	7.8	......	2.7	1.0	16.7
7	.7	7.8	.35	2.6	.9	13.3
8	.6	5.8	.5	4.2	1.0	16.7
9	.6	5.8	.6	5.8	1.1	21
10	.6	5.8	.5	4.2	1.1	21
11	.5	4.2	.5	4.2	......	21
12	.5	4.2	.5	4.2	......	21
13	.7	7.8	.4	3.0	1.1	21
14	.6	5.8	.4	3.0	1.0	16.7
15	.5	4.2	.4	3.0	.9	13.3
16	.5	4.2	.35	2.6	.9	13.3
17	.5	4.2	......	2.6	.8	10.4
18	.4	3.0	......	2.6	.75	9.1
19	.4	3.0	......	2.6	.75	9.1
20	.4	3.0	......	2.5	.7	7.8

Day.	June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
21	0.4	3.0	......	2.3	0.65	6.8
22	.4	3.0	0.3	2.1	.6	5.8
23	.4	3.0	......	4.7	.9	13.3
24	.6	5.8	.7	7.8	......	......
25	.5	4.2	.5	4.2	......	......
26	.5	4.2	.5	4.2	......	......
27	.5	4.2	.5	4.2	......	......
28	.4	3.0	.45	3.6	......	......
29	.4	3.0	.45	3.6	......	......
30	.4	3.0	.45	3.6	......	......
31	......	......	.45	3.6	......	......
Mean discharge	......	5.18	......	3.50	......	13.2
Maximum	......	13.3	......	7.8	......	25
Minimum	......	3.0	......	2.1	......	3.0
Accuracy	......	A	......	A	......	A

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in Eureka Creek drainage basin in 1908 and 1909:

Miscellaneous measurements in Eureka Creek drainage basin from 1908 to 1909.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. m.*	*Sec.-ft.*
Aug. 21, 1908	Eureka Creek	Baker Creek	Claim "No. 14 above"	0.77	2.8	0.28
Do	do	do	Above Boston Creek	1.3	5.4	.24
July 22, 1909	do	do	do	1.2	5.4	.22
July 23, 1909	do	do	do	6.9	5.4	.78
Sept. 4, 1909	do	do	do	2.4	5.4	.44
Aug. 6, 1908	do	do	Mouth	4.8	37.7	.13
June 7, 1908	What Cheer Bar ditch		Seattle Creek	10.6		
Do	do		Below spillway	4.0		

HUTLINANA CREEK DRAINAGE BASIN.

DESCRIPTION.

Hutlinana Creek is tributary to Baker Creek about 7 miles from Tanana River, near the southern border of the Baker flats. For the first mile or two the stream flows nearly due north; it then turns gradually toward the west, passing the south slope of Wolverine Mountain, and finally takes a general southwesterly course to the mouth. It has a broad, gravelly bed with sharp banks and follows a winding course, making many abrupt turns in passing from one side of the valley to the other. In general, however, it keeps near the left side. The topography of the Hutlinana Valley presents strong contrasts—from Wolverine Mountain, with an elevation of 4,600 feet, to the marshy alluvial Baker flats.

Above Elephant Creek the east side of the Hutlinana Valley rises precipitously and is broken by fewer tributaries than the west side, which is cut by many small streams and exhibits a gradual benchlike slope for a considerable distance back from the stream, beyond which it rises rapidly to the summit of Elephant and Wolverine mountains. The gravelly bottom forms a watercourse of such nature that during a period of protracted drought 50 per cent or even more of the run-off may pass beneath the surface. Many other streams in the Rampart region have the same characteristic features.

The valley contains a thick growth of timber, much of which is suitable for milling. A sawmill has been in operation on the creek at times for several winters, and nearly all the Baker Creek mines are supplied with lumber from this source.

About a mile below Elephant Gulch a hot spring rises in the bed of the creek and prevents the creek from freezing for a considerable distance even during the intense cold of the winter months. In the vicinity of the spring there are several acres of warm ground, now covered with a luxuriant growth of large spruce, poplar, and birch, which on clearing would be suitable for agriculture. F. E. Diver has taken up a homestead about the spring, and during the summer of 1908 he constructed a large cabin that could be used as a road house, put under cultivation some small patches of ground, and successfully raised several varieties of vegetables.

Considerable exploring has been done near the headwaters of the creek, but the presence of ground water and the lack of suitable machinery have prevented systematic prospecting and the working of ground that, under more favorable conditions, might yield gold in paying quantities.

Caribou, Denver, and Ohio creeks, and Elephant Gulch are small tributaries of Hutlinana Creek from the right near the headwaters. Goff and Applegate creeks, the two larger tributaries of Hutlinana Creek, enter it from the east about 12 miles from the head. Applegate Creek is said to have several good-sized thermal springs in its upper drainage which furnish the greater portion of the run-off during the low-water season.

HUTLINANA CREEK NEAR CAIRO CREEK.

A gage was installed June 9, 1908, on the left bank of Hutlinana Creek a short distance below Cairo Creek. Readings were taken until August 31. On September 1, 1909, a gage was installed above Cairo Creek on the left bank, about 500 feet below the hot springs, from which all subsequent readings were made.

The rating curve for the section below Cairo Creek is well developed for all stages. The curve for the section above Cairo Creek is well defined below 80 second-feet and fairly well developed for all stages. The gage was only read to the nearest tenth of a foot, so at low stages considerable error may result thereby, but the mean flow for periods of a week or more should not be greatly in error, and the monthly means are believed to be very accurate.

Discharge measurements of Hutlinana Creek above Cairo Creek in 1908–9.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
1908.				1909.			
Sept. 1	C. E. Ellsworth	0.80	14.9	July 11	Clarence Hamshaw	1.01	25
1909.				25	Harry Turnbull	1.17	44
Apr. 20	do	.32	*a* 4	25	do	1.25	37
May 23	do	2.48	173	25	C. E. Ellsworth	1.23	41
July 6	Clarence Hamshaw	.99	23	26	do	1.17	34
Do	do	.99	24	31	Harry Turnbull	1.40	53

a This measurement represents the discharge of the hot springs. There was no surface run-off from the basin above the hot springs at the time the measurement was made.

Daily gage height, in feet, and discharge, in second-feet, of Hutlinana Creek above Cairo Creek for 1908–9.

[Drainage area, 42.7 square miles. Observer, F. E. Diver.]

Day.	September.		October.		Day.	September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.		Gage height.	Discharge.	Gage height.	Discharge.
1908.					1908—Con.				
1	0.8	15	0.8	15	21	1.0	24	0.7	11
2	.8	15	.8	15	22		22		11
3		16		15	23		21		10
4		18	.8	15	24		20		9
5	.9	19		15	25	.9	19		8
6	.9	19	.8	15	26	.9	19	.6	7.5
7		19		14	27		18	.7	11
8	.9	19		13	28		17	.7	11
9		19		12	29		16		
10	.9	19	.7	11	30	.8	15		
11		19	.7	11	31				
12	.9	19		11	Mean discharge		19.1		11.7
13	.9	19		11	Second-feet per square mile		0.447		0.274
14		19		11					
15	.9	19	.7	11					
16		19		11	Run-off (depth in inches on drainage area)		0.50		0.28
17	.9	19	.7	11					
18		22		11	Maximum		24		15
19	1.0	24	.7	11	Minimum		15		7.5
20	1.0	24		11	Accuracy		A		A

Daily gage height, in feet, and discharge, in second-feet, of Hutlinana Creek above Cairo Creek for 1908–9—Continued.

Day.	April.		May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1909.										
1			0.8	15	1.7	81	1.0	24	1.35	49
2			.9	19	1.7	81	1.0	24	1.3	45
3			.5	4.5	1.8	91	1.0	24	1.4	53
4			.7	11	1.8	91	1.0	24	1.8	91
5			.6	7.5	1.7	81	1.0	24	2.5	176
6			.8	15		77	1.0	24	2.0	113
7			1.0	24		72	1.0	24	1.7	81
8				43		67	1.1	30	1.7	81
9			1.5	62	1.5	62	1.1	30	3.5	315
10			1.6	71	1.4	53	.98	23	2.5	176
11			1.6	71	1.3	45	1.0	24	2.0	113
12			1.9	102	1.3	45	1.01	25	1.8	91
13			1.5	62	1.4	53	1.0	24	1.6	71
14			1.7	81	1.5	62	1.0	24	1.4	53
15			2.2	138	1.4	53	1.0	24	1.4	53
16			1.9	102	1.3	45	1.0	24	1.3	45
17				112	1.3	45	.9	19	1.3	45
18				122	1.3	45	.9	19		
19				132	1.2	37	.9	19		
20	0.32	0.4		142	1.2	37	.9	19		
21	.35	1.0		152		34	1.0	24		
22	.4	2.0		162	1.1	30	1.2	37		
23		1.5	2.48	173	1.1	30	1.2	37		
24	.35	1.0	2.6	190	1.5	62	1.4	53		
25	.4	2.0	2.7	204	1.3	45	1.25	41		
26	.35	1.0	2.4	163	1.2	37	1.2	37		
27	.4	2.0	2.0	113	1.1	30	1.2	37		
28	.35	1.0	1.8	91	1.0	24	1.2	37		
29		1.5	1.7	81	1.0	24	1.2	37		
30	.4	2.0		81	1.0	24	1.55	66		
31				81			1.4	53		
Mean discharge		1.4		91.2		52.1		30.0		97.1
Second-feet per square mile		0.033		2.14		1.22		0.703		2.27
Run-off (depth in inches on drainage area)		0.01		2.47		1.36		0.81		1.44
Maximum		2.0		204		91		66		315
Minimum		0.4		4.5		24		19		45
Accuracy		A		B		A		A		B

Discharge measurements of Hutlinana Creek below Cairo Creek in 1908.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
June 9	1.32	76	Aug. 19	0.50	10.5
25	1.00	41	Sept. 1	.65	14.9

Daily gage height, in feet, and discharge, in second-feet, of Hutlinana Creek below Cairo Creek for 1908.

[Drainage area, 44.2 square miles. Observer, F. E. Diver.]

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
1			0.9	32	0.6	13
2			.9	32		13
3				31		13
4				30		12
5				29		12
6				28		12
7				27		12
8				26		12
9	1.3	74		25		12
10	1.3	74	.8	24		12
11		86	.8	24		12
12	1.5	97	.8	24		12
13	1.6	109		24		12
14	1.7	122	.8	24		11
15	1.7	122	.8	24		11
16		109	.8	24		11
17	1.5	97		23		11
18	1.4	86		21		11
19	1.3	74		20	.5	10
20		66		19	.5	10

Day.	June. Gage height.	June. Discharge.	July. Gage height.	July. Discharge.	August. Gage height.	August. Discharge.
21		59	0.7	17	0.5	10
22	1.1	52		17		10
23	1.1	52	.7	17		10
24	1.1	52		17		10
25	1.0	41		17		9
26		38	.7	17		9
27		35		16		9
28	.9	32		14		9
29	.9	32	.6	13		10
30	.8	24		13		12
31				13		14
Mean discharge		69.7		22.0		11.2
Second-feet per square mile		1.58		0.498		0.253
Run-off (depth in inches on drainage area)		1.29		0.57		0.29
Maximum		122		32		13
Minimum		24		13		9
Accuracy		A		A		B

NOTE.—The discharges on days of missing gage heights were estimated by aid of comparative records and known climatologic conditions and are believed to be very nearly correct.

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Hutlinana Creek drainage basin in 1908 and 1909:

Miscellaneous measurements in Hutlinana Creek drainage basin, 1908–9.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
Aug. 20, 1908	Hutlinana Creek	Baker Creek	Below Caribou Creek	1.9	16.1	0.12
Sept. 2, 1908	do	do	do	3.1	16.1	.19
July 7, 1909	do	do	Above Denver Creek	*a* 11.9	23.7	.50
26, 1909	do	do	do	24	23.7	1.01
Sept. 5, 1909	do	do	do	9.1	23.7	.38
Aug. 20, 1908	Ohio Creek	Hutlinana Creek.	½ mile above mouth	.93	3.2	.29
Do	Elephant Gulch	do	Mouth	1.1	3.3	.33
Do	Goff Creek	do	½ mile above mouth	2.4	11.4	.21
Do	Applegate Creek	do	1 mile above mouth	2.8	18.9	.15

a Measurement made by Clarence Hamshaw.

NOTE.—The measurements of Hutlinana Creek above Caribou Creek and above Denver Creek were made near proposed diversion points for ditch systems to carry water to the mines on Pioneer Creek.

PATTERSON CREEK DRAINAGE BASIN.

DESCRIPTION.

Patterson Creek is formed by the junction of Sullivan and Cache creeks. It is about 30 miles long and follows a general southwesterly course roughly parallel to Tanana River, which it joins about midway between Hot Springs and Fort Gibbon. It drains an area of low relief, the most prominent feature of which, Bean Ridge, on the southeast, furnishes it several small tributaries.

Sullivan Creek, the right fork of Patterson Creek, rises on the south slope of Roughtop Mountain, and for about 10 miles flows a little west of south through a wide valley, flanked on either side by long, gentle slopes. Birch and spruce timber suitable for cabins and fuel is abundant in the lower valley.

Woodchopper Creek drains a relatively low swampy area between Sullivan Creek on the east and American Creek and Fish Lake on the west.

SULLIVAN CREEK ABOVE TOFTY DITCH INTAKE.

A gage was installed on Sullivan Creek August 4, 1908, just above the intake to the Tofty ditch and about 6 miles above the mouth of the creek. During periods of average flow nearly the entire discharge of the creek is diverted just below the gage and conducted in a ditch along the right limit hillside to Tofty Gulch, where it is used in open-cut sluicing. The ditch is 7,000 feet long, with a bottom width of 4.5 feet and a grade of $6\frac{2}{3}$ feet per mile.

The 1908 rating curve is rather poorly defined. That of 1909 is well defined below 40 second-feet. The measuring conditions were good and the channel seemed to be fairly permanent. Some water was diverted from the creek above the gage in the Midnight Sun ditch at a time of ample supply in 1909, and the records therefore show a run-off slightly less than the actual one.

Discharge measurements of Sullivan Creek above Tofty ditch intake in 1908–9.

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1908.	*Feet.*	*Sec.-ft.*	1909.	*Feet.*	*Sec.-ft.*
Aug. 4	0.80	5.7	May 28	1.00	31
24	.70	4.5	29	.72	14.6
			July 19	.11	1.8
			20	.12	2.2

Daily gage height, in feet, and discharge, in second-feet, of Sullivan Creek above Tofty ditch intake for 1908–9.

[Drainage area, 15.6 square miles. Observer, Joseph Eglar.]

Day.	1908		1909									
	August.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	......	......	......	......	0.70	13.8	0.15	2.3	0.12	2.1	......	2.8
2	......	......	......	......	.70	13.8	.12	2.1	.09	1.9	......	2.8
3	......	......	......	......	.65	12.1	.15	2.3	.80	18.5	......	2.8
4	0.8	6.0	......	......	.90	24	.15	2.3	.60	10.4	......	2.8
5	.7	4.3	......	......	1.00	31	.12	2.1	1.70	106	......	2.8
6	.7	4.3	......	......	1.00	31	.11	2.0	1.50	82	......	2.8
7	.7	4.3	......	......	.80	18.5	.10	2.0	.90	24	......	2.8
8	.68	4.0	......	......	.65	12.1	.30	4.0	1.70	106	......	2.8
9	.65	3.6	......	......	.50	7.7	.25	3.4	2.10	158	......	2.8
10	.62	3.2	......	......	.50	7.7	.20	2.8	......	110	......	2.8
11	.6	3.0	......	......	.45	6.6	.25	3.4	......	70	......	2.8
12	.6	3.0	......	......	.45	6.6	.20	2.8	......	40	......	2.8
13	.6	3.0	......	......	.45	6.6	.20	2.8	......	15	......	2.8
14	.6	3.0	......	......	.40	5.5	.30	4.0	.50	7.7	......	2.8
15	.6	3.0	......	......	.40	5.5	.50	7.7	.50	7.7	0.20	2.8
16	.62	3.2	......	......	.40	5.5	.30	4.0	.40	5.5	......	2.8
17	.65	3.6	......	......	.35	4.8	.21	2.9	.25	3.4	.20	2.8
18	1.5	42	......	......	.30	4.0	.20	2.8	.25	3.4	......	......
19	1.4	33	......	......	.28	3.8	.20	2.8	.25	3.4	......	......
20	1.3	26	......	......	.28	3.8	.75	16.2	......	3.2	......	......
21	.85	7.2	......	......	.21	2.9	.75	16.2	......	3.0	......	......
22	.85	7.2	......	......	.20	2.8	.75	16.2	......	2.8	......	......
23	.7	4.3	......	......	.20	2.8	.50	7.9	......	2.6	......	......
24	.7	4.3	......	......	.20	2.8	.70	13.8	......	2.4	......	......
25	......	......	......	......	.45	6.6	.50	7.7	......	2.2	......	......
26	......	......	......	......	.30	4.0	.55	9.0	......	2.0	......	......
27	......	......	......	......	.25	3.4	.65	12.1	.10	2.0	......	......
28	......	......	0.90	24	.20	2.8	.45	6.6	......	2.0	......	......
29	......	......	.70	13.8	.19	2.7	.32	4.3	......	2.0	......	......
30	......	......	.40	5.5	.18	2.6	.40	5.5	......	2.0	......	......
31	......	......	......	9.6	......	......	.25	3.4	......	2.0	......	......
Mean discharge	......	8.34	......	13.2	......	8.59	......	5.72	......	25.9	......	2.80
Second-feet per square mile	......	0.533	......	0.846	......	0.551	......	0.367	......	1.66	......	0.180
Run-off (depth in inches on drainage area)	......	0.42	......	0.13	......	0.61	......	0.42	......	1.91	......	0.11
Maximum	......	42	......	24	......	31	......	16.2	......	158	......	2.8
Minimum	......	3.0	......	5.5	......	2.6	......	2.0	......	1.9	......	2.8
Accuracy	......	C	......	B	......	A	......	A	......	C	......	C

MISCELLANEOUS MEASUREMENTS.

The following miscellaneous discharge measurements were made in the Patterson Creek drainage basin in 1908 and 1909:

Miscellaneous measurements in Patterson Creek drainage basin in 1908 and 1909.

Date.	Stream.	Tributary to—	Locality.	Discharge.	Drainage area.	Discharge per square mile.
				Sec.-ft.	*Sq. m.*	*Sec.-ft.*
Aug. 26, 1908	Quartz Creek	Sullivan Creek	½ mile above mouth	2.8	8.0	0.35
July 20, 1909	....do	....do	Mouth	1.3	11.3	.12
Aug. 4, 1908	Cache Creek	Patterson Creek	Trail crossing to mouth of Baker Slough.	3.2	22.7	.14
July 19, 1909	....do	....do	....do	2.5	22.7	.11
May 28, 1909	Midnight Sun ditch		Outlet	6.5	......	......
Aug. 25, 1908	Woodchopper Creek	(a)	Trail crossing	4.4	19.7	.22

a Reconnaissance map of Rampart quadrangle shows Woodchopper Creek flowing into Fish Lake. According to a statement by a local prospector, it is tributary to Patterson Creek, about 6 miles from Tanana River.

MINIMUM DISCHARGE.

The computed minimum discharge for a single day is often subject to errors which make it less reliable than the mean for a longer period, and it is therefore customary in estimates of minimum discharge to select the mean discharge for the minimum week. The following table has been compiled to show the mean discharge in second-feet, and in second-feet per square mile, for the minimum week, from representative drainage areas. It should be borne in mind that all the records are not directly comparable, because their durations at the different stations are not the same. An analysis of the results shows no relation between the size of the drainage area and the minimum flow; in fact, it indicates that within certain limits each drainage area is a law unto itself. The relatively high minimums of Chena River above Little Chena, Salcha River at the mouth, and Seventymile River at the falls, indicate conditions in the mountains occupying the east-central portion of the Yukon-Tanana region which contribute toward an increased minimum discharge. The nature of these conditions is beyond conclusive determination by the data available. The low minimum of South Fork of Fortymile River at Franklin indicates conditions productive of a very low discharge in the southeastern portion of the region. A considerable proportion of this drainage area is flat and swampy and it exercises an influence on run-off somewhat comparable to lake storage, but this does not explain the low minimum except so far as it may be ascribed to increased evaporation losses.

Thus comparison and analysis show that the minimum discharges are probably determined by the diverse characteristics of the drainage areas and vary widely. The minimum run-off in second-feet per square mile for many of the typical placer streams varies from 0.10 to 0.20, and this represents approximately what may be expected from the average drainage area. Such a run-off, however, is by no means general, for there are many pronounced exceptions dependent upon special condition. Careful study of the existing data and a comparison of physical conditions will furnish a basis for estimating the minimum discharge of streams other than those upon which records are available.

The minimum summer flow for several seasons took place on the majority of the streams in the region in the first part of August, 1911. In each of the other seasons, however, the streams fell nearly as low as in 1911. The durations of low-water periods varied from about one to three weeks and in some seasons occurred two or three times. The variations in discharge from the same area for different years are shown on Plate VIII, on which are platted hydrographs of daily discharge of Chatanika River from 1907 to 1912.

Mean discharge for minimum week at various stations in Yukon-Tanana region.

Station.	Duration of record.	Week of minimum discharge.	Mean discharge for minimum week.	Drainage area.	Minimum discharge per square mile.
			Sec.-ft.	*Sq. mi.*	*Sec.-ft.*
South Fork Fortymile River at Franklin	1910–1912	Aug. 2–8, 1910	157	3,180	0.049
Fortymile River at Steel Creek	do	Aug. 5–11, 1911	516	5,890	.088
Mosquito Fork at Kechumstuk	do	Aug. 2–8, 1910	45	824	.055
Kechumstuk Creek at mouth	do	do	12.0	189	.064
Wade Creek at claim "No. 10 above"	do	July 1–7, 1912	.89	23.1	.038
Fortyfive Pup at claim No. 13	do	Aug. 1–7, 1910	.61	9.1	.067
North Fork Fortymile River at "kink"	do	Aug. 4–10, 1911	210	2,010	.104
Steel Creek at mouth	do	Aug. 1–7, 1910	.23	12.5	.018
Canyon Creek below Squaw Gulch	do	do	7.0	59.5	.118
Squaw Gulch at claim "No. 1 above"	do	Aug. 4–10, 1911	.47	24.4	.019
American Creek at claim "No. 8 above"	do	July 5–11, 1912	2.1	24.1	.087
Discovery Fork below Star Gulch	do	July 4–10, 1910	1.0	14.8	.068
Seventymile River at the falls	do	Aug. 3–9, 1911	136	465	.292
Flume Creek ½ mile above mouth	do	Aug. 23–29, 1910	17.3	36.7	.470
Crooked Creek below Eldorado Creek	do	Aug. 1–7, 1910	1.4	17.2	.087
Birch Creek above Twelvemile Creek	1911	Aug. 2–8	11.7	88	.133
Birch Creek below Twelvemile Creek	1911–12	Aug. 1–7, 1911	19.5	141	.138
Birch Creek below Clums Fork	1910–11	Aug. 2–8, 1911	54	600	.084
Birch Creek above Sheep Creek	1911–12	Aug. 3–9, 1911	90	873	.103
Birch Creek at Fourteenmile House	1908–1912	Aug. 4–10, 1911	218	2,150	.101
Buckley Bar Creek at mouth	1911–12	Aug. 3–9, 1911	.33	10.6	.031
Porcupine Creek below Bonanza Creek	1908–1912	Aug. 7–13, 1911	2.4	39.9	.061
Crooked Creek at Central House	1909–1912	Aug. 5–11, 1911	4.5	161	.028
Deadwood Creek above Switch Creek	do	Sept. 3–9, 1911	1.2	21.3	.057
Nome Creek above Ophir Creek	1911–12	Aug. 3–9, 1911	14.8	76	.195
Troublesome Creek below Quail Creek	1908–1910	Aug. 12–18, 1908	6.8	43.2	.157
Minook Creek above Little Minook Creek	1908	do	31	130	.238
Hoosier Creek at claim "No. 11 above"	1908–9	Aug. 16–22, 1909	4.1	27.7	.148
Little Minook Creek at claim "No. 9 above"	do	July 17–22, 1908	.60	5.9	.102
Salcha River at mouth	1909–10	Aug. 10–16, 1910	1,050	2,170	.484
Junction Creek above Moose Lake outlet	1909–10, 1912.	Aug. 15–21, 1910	3.8	23.6	.161
Banner Creek at mouth	1909–10	Aug. 14–20, 1910	2.4	21.5	.112
Chena River above Little Chena River	1910–1912	Aug. 5–11, 1911	457	1,440	.317
Little Chena River above Sorrels Creek	1907–8, 1910	July 15–21, 1910	22	79	.278
Little Chena River above Fish Creek	1908–1910	Aug. 10–16, 1910	39	228	.171
Sorrels Creek above Elliott Creek	1907–8, 1910	do	3.8	21	.181
Elliott Creek at mouth	do	do	2.4	13.8	.174
Fish Creek below Solo Creek	1910–1912	Aug. 1–7, 1911	4.6	21.5	.214
Fish Creek above Fairbanks Creek	1907–8	Aug. 7–13, 1908	13.1	39.0	.336
Fish Creek at mouth	1908, 1910	Aug. 9–15, 1910	12.8	90.2	.142
Washington Creek above Aggie Creek	1908	Aug. 7–13	22	117	.188
Washington Creek below Aggie Creek	do	Aug. 6–12	28	147	.190
Aggie Creek at mouth	do	Aug. 7–13	6.0	35.8	.167
McManus Creek at mouth	1907, 1910–1912.	Aug. 1–7, 1911	12.0	80	.150
Chatanika River at Faith Creek	1907–8, 1910–1912.	Aug. 3–9, 1911	25	132	.189
Chatanika River at Poker Creek	1907–1912	do	94	456	.206
Smith Creek above Pool Creek	1911	Aug. 1–7	2.0	17.0	.118
Pool Creek at mouth	do	do	1.5	14.0	.107
Faith Creek at mouth	1907–1911–12.	Aug. 3–9, 1911	14.6	51	.286
New York Creek at ditch intake	1908–9	Aug. 9–15, 1908	.8	4.7	.170
California Creek at ditch intake	do	Aug. 11–17, 1908	2.4	6.7	.358
Pioneer Creek at ditch intake	do	Aug. 8–14, 1908	2.6	8.1	.321
Hutlinana Creek below Cairo Creek	1908	Aug. 22–28	9.4	44.2	.213
Sullivan Creek above Tofty ditch intake	1908–9	Aug. 25–31, 1909	2.0	20.7	.097

WATER POWER.

GENERAL CONDITIONS.

The development of water power in the Yukon-Tanana region, with the exception of a small plant on Poker Creek, has not gone beyond the period of preliminary investigation. It would be physically possible to develop considerable power on certain streams in this region during the summer months, but it is very doubtful if such an enterprise would pay.

Aside from a few small lode mines and municipal purposes the market for power at the present time depends entirely on the needs of the placers.

In 1912 one dredge was in operation in the Fairbanks district, one in the Birch Creek basin, and three in the Fortymile basin. The total horsepower required to operate these five dredges was probably less than 1,000. The underground placer mines in the Fairbanks district consume considerable power in hoisting the gravel and pumping water, but as most of them are operated under separate management with adequate facilities for developing power already installed it is not likely that their aggregate demand would be more than a few hundred horsepower. Deep placer mining is already declining, and it is doubtful if its needs should be taken into account at all in estimating the future market for hydroelectric energy. More dredges will undoubtedly be installed in this region in the future and lode mining will probably increase.

The largest steam plant in the Yukon-Tanana region is that of the Northern Commercial Co., at Fairbanks, which furnishes electric light, steam heat, and water service for the town. The plant has an aggregate boiler capacity of 620 horsepower, with an average annual fuel consumption of about 8,000 cords of wood.

The problem of obtaining power is becoming more serious as the fuel supply diminishes. So far wood has been used exclusively for the development of steam, and each year its cost increases because of the greater distance it has to be transported. The economy of a steam plant located in the center of a heavily timbered area to develop electricity for general distribution might be worthy of consideration.

The lignites of the Nenana coal fields[1] south of Fairbanks will always offer a possibility for power development and should be carefully considered before any large water-power installation is undertaken.

One of the strongest arguments against the use of water for power in this latitude is the short season that it would be available and the resulting necessity of an auxiliary steam plant to supplement the deficient water supply during the spring and autumn and during the low-water periods of the summer, and to supply the total demand from perhaps the middle of November until the middle of May.

During 1909–10 a hydroelectric plant with a maximum capacity of 10,000 horsepower was installed in the Yukon Territory on Klondike River, about 25 miles from Dawson. The water is diverted from North Fork of Klondike River and carried in a ditch for several miles into Klondike River valley, where a head of 234 feet is obtained. Nothing definite is known regarding the success of the plant, but the

[1] Capps. S. R., The Bonnifield region, Alaska: U. S. Geol. Survey Bull. 501, pp. 54–62, 1912.

similarity of the climatic and economic conditions under which it was built and is operated to those existing in the Yukon-Tanana region and the fact that it is the only hydroelectric plant of consequence yet installed that does come under those conditions, should make it invaluable as an object lesson for prospective investors.

A small hydroelectric plant was installed on Poker Creek about 30 miles from Fairbanks in 1907–8. The water was obtained from Poker, Little Poker, and Caribou creeks and carried to a point on Chatanika River, where a head of about 80 feet was obtained. It is understood that the plant was not successfully operated because of lack of water and various other reasons peculiar to management and operation.

The streams of the Yukon-Tanana region are subject to large variations in flow. The maximum discharge may be several hundred times the minimum. Most of the ice and snow that accumulates in the winter melts during May and June. If the excess water of that period could be stored and rendered subject to power demands several streams on which the minimum flow is naturally too low to permit economic development might offer favorable possibilities. There are, however, no natural reservoir sites or lakes at a sufficient elevation that could be used for storage.

The grades of the streams are remarkably uniform, showing very few concentrated falls of consequence. Pressure would have to be obtained by carrying the diverted water in ditches or pipes for a distance sufficient to furnish the required head.

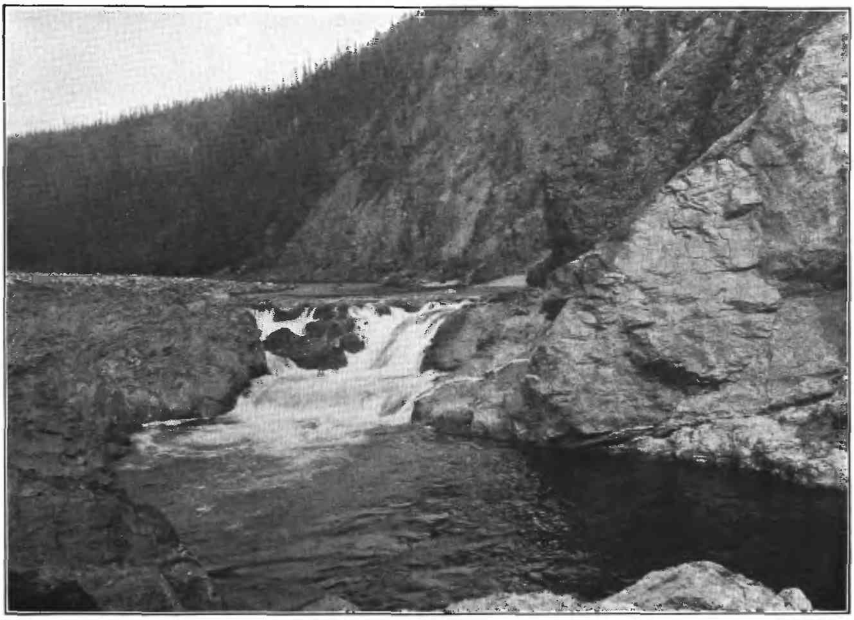
POWER SITES.

FORTYMILE RIVER BASIN.

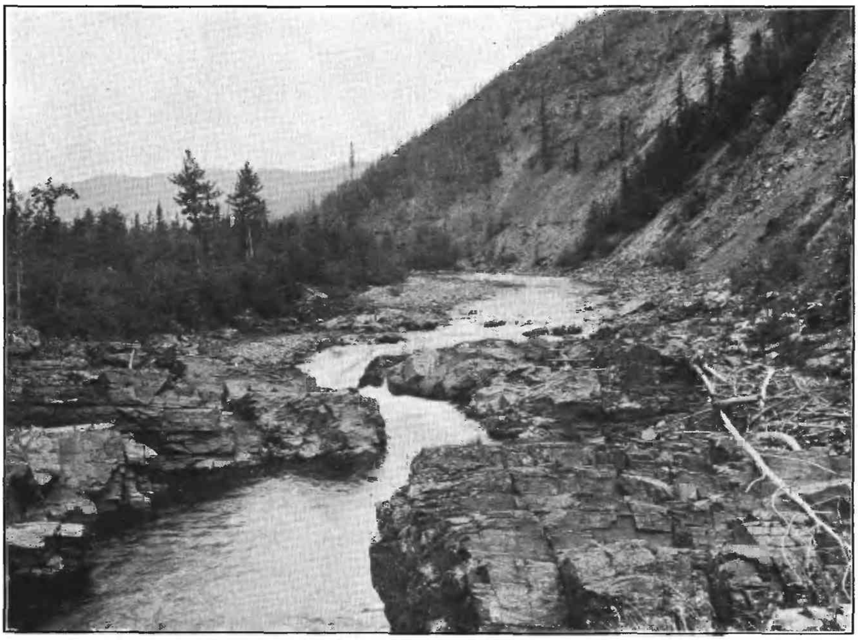
Near the headwaters of the tributaries of Fortymile River there are a number of points where the streams have considerable grades and might furnish feasible sites for water-power plants, if the demand were ever sufficient. However, at most of these sites the summer minimum is so low that it would seriously hamper operations. The basin offers no adequate storage possibilities.

At present the most likely market for hydroelectric power appears to be offered by the possible installation of dredges on Chicken Creek, Wade Creek, South Fork, and the main Fortymile below the forks. Most available for supplying such a market are the following:

On Dennison Fork in the vicinity of the forks, 12 miles above the mouth, the topographic map shows a fall in the stream of about 200 feet in 10 miles. A portion of this fall might be capable of development by a ditch diversion to a lower point in the valley. The minimum flow in summer is approximately 100 second-feet.



A. NORTH FORK OF FORTYMILE RIVER AT THE "KINK."



B. FALLS ON SEVENTYMILE RIVER.

Between the mouths of Kechumstuk and Chicken creeks, in a distance of about 28 miles, Mosquito Fork falls 600 feet. The fall is greatest in the upper portion, where the stream emerges from the old valley floor above Kechumstuk and enters the present one, and the topography and geologic formation seem better suited for economical ditch construction in this portion than lower down. It is estimated that about 12 miles of ditch diverting from the left of Mosquito Fork below the mouth of Kechumstuk Creek would carry water to a point near the mouth of Gold Creek where a head of 100 to 150 feet would be available. The minimum flow is approximately 45 second-feet. This supply might be augmented by a ditch about 8 miles long, diverting from Gold Creek, which probably has a minimum of about 10 second-feet. A head of 100 feet and a minimum flow of 55 second-feet should be capable of producing 500 horsepower for 5 months of the year. The flow of Mosquito Fork is shown in the tables. (See p. 77.)

On North Fork two points offer possibilities for power development. About a mile below the union of North and Middle forks there is a rapids in which the river has a very sharp grade for a short distance, but its amount is not known. The river at this point has a flow practically the same as that at the "kink." (See p. 95.)

About 10 miles below the junction of North and Middle forks, the river formerly followed a large meander locally known as the "kink." Although the distance around it was 2¾ miles, the two channels at the neck of the meander were separated by a sharp rock ridge only about 100 feet high and about 100 feet wide at the water level. Several years ago a channel was blasted through the rock ridge to divert the water and thus drain the meander for mining. A fall of about 17 feet was thus concentrated in a horizontal distance of about 100 feet. A view of the "kink" is shown in Plate IX, *A*. The minimum discharge of North Fork is estimated at about 200 second-feet, and this with an available head of 17 feet should be capable of supplying 300 horsepower from about May 15 to October 1. A large portion of the season the flow would be greater. (See horsepower table, p. 332.)

SEVENTYMILE RIVER BASIN.

From Diamond Fork to the mouth, a distance of about 53 miles following the general trend of the valley, Seventymile River has a fall of over 2,000 feet. From Diamond Fork to Barney Creek it falls 1,400 feet in 25 miles. There are no concentrated falls in this stretch, but ditches diverting at favorable points could make available considerable fall in comparatively short distances. At a point about one-half mile below Washington Creek the river passes into a rock canyon, where it falls rapidly for about 300 feet and has a concentrated fall of about 9 feet. (See Pl. IX, *B*.) The head which could be developed is about 15 feet and probably 200 horsepower could be depended upon throughout the summer. (See horsepower table, p. 332.) There is no present power market in view on Seventymile River. There is considerable wood for fuel in the basin and this would probably furnish the most economical source of power for many years.

BIRCH CREEK BASIN.

Records of stream flow have been kept in the Birch Creek basin at various points since 1908. They show that a very low run-off should be expected for about a month during the middle of the summer. There is also a period of low flow in the fall before the freeze-up. The creek falls 1,000 feet between the mouth of Twelvemile Creek and a point in the flats about 15 miles below South Fork. The distance is about 70 miles by map measure. The topographic map shows a fall of about 20 feet per mile in the vicinity of Great Unknown Creek and Clums Fork; also for several miles above and below the South Fork. There is no doubt but that considerable power could be developed for three or four months each summer (see table, p. 332), but the conditions along the stream are not very favorable for ditch construction. Considerable rock work or fluming would have to be done.

CHATANIKA RIVER BASIN.

Chatanika River offers perhaps the most favorable opportunity for hydroelectric development of any of the streams in Fairbanks district. By constructing a ditch for 12 or 15 miles along the river, diverting water from a point near the junction of Faith and McManus creeks, a head of about 400 feet could be obtained. Daily records of stream flow were kept at this point during parts of the summers of 1907–8 and 1910–1912. (See p. 281.) The minimum flow recorded during that period was 24 second-feet from August 4 to 8, 1911. From 800 to 1,000 horsepower could probably be developed at this point from the later part of May until the later part of September. (See table, p. 332.) A transmission line about 40 miles in length would reach the center of the mining district.

From Kokomo Creek to Poker Creek, a distance of about 10 miles, the river drops 100 feet. Daily records of stream flow were kept at Poker Creek during the summers of 1907–1912. (See p. 285.) The minimum recorded flow was 87 second-feet, which could produce from 700 to 800 horsepower under a 100-foot head. (See table, p. 332.)

From Faith Creek to Eldorado Creek, a distance of about 50 miles the river falls through a height of about 800 feet.

WASHINGTON CREEK.

Washington Creek has been considered as a source of power. During 1908 daily records were kept at the junction of Aggie Creek, below which there is a fall of approximately 200 feet in about 8 miles. The records, however, indicate an insufficient supply for power development, unless considerable storage could be provided, which probably would not be feasible.

CHENA RIVER BASIN.

No particularly favorable opportunities for water-power development are known to exist in the Chena River basin. From a study of the topographic map the Chena shows a relatively high gradient above North Fork, but the stream-flow data are hardly sufficient to warrant any estimate of the power that could be developed.

In the Little Chena basin considerable study of the water supply was made in 1907, 1908, and 1910. It was proposed to gather the water from the upper tributaries at an elevation of about 900 feet, and convey it by ditch line to a point in the lower drainage area on the right bank of the river, where a fall of about 200 feet could be obtained. The water supply was found to be entirely inadequate.

SUMMARY.

The records of stream flow at points showing the greatest possibility for water-power development have been briefly summarized in the table below. In comparing the columns showing days of deficient discharge for several years on any stream, allowance should be made for the difference in the length of periods and also for the part of the season covered by the records. Ordinarily the longer the period the greater will be the number of days of deficient discharge for any given number of horsepower and the less favorable will be the comparison with some other year in which the records extend over a shorter length of time. Also the days of deficient discharge will be a greater percentage of the total number of days if the observations include only the low-water months.

The table gives the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge and shows the number of days on which the discharge and the corresponding horsepower were respectively less than the amounts given in the columns for "discharge" and "horsepower."

Estimated discharge and horsepower for North Fork of Fortymile and Seventymile rivers for 1910–1912.

Discharge in second-feet.	Horsepower per foot fall (80 per cent efficiency).	Days of deficient discharge.					
		North Fork of Fortymile River at the "kink."			Seventymile River at the falls.		
		July 9 to Sept. 23, 1910.	May 19 to Sept. 20, 1911.	May 5 to Oct. 13, 1912.	June 16 to Sept. 30, 1910.	June 20 to Sept. 5, 1911.	May 3 to Oct. 18, 1912.
110	10	......	......	......	......	0	......
132	12	......	......	......	......	5	0
154	14	......	0	......	......	16	3
176	16	......	1	......	......	30	6
198	18	......	3	......	0	42	8
220	20	0	5	......	4	43	13
242	22	1	9	......	10	47	19
264	24	4	10	......	16	50	22
286	26	7	10	......	22	57	26
308	28	11	17	......	31	61	60
330	30	17	19	0	33	64	63
385	35	25	22	2	49	71	96
440	40	35	23	4	57	74	101

Estimated discharge and horsepower for Chatanika River and Birch Creek for 1907–1912.

Discharge in second-feet.	Horsepower per foot fall (80 per cent efficiency).	Days of deficient discharge.												
		Chatanika River below Faith Creek.					Chatanika River below Poker Creek.						Birch Creek above Sheep Creek.	
		June 21 to Sept. 30, 1907.	July 13 to Sept. 30, 1908.	May 25 to Sept. 25, 1910.	May 24 to Sept. 24, 1911.	May 15 to Sept. 30, 1912.	June 20 to Oct. 14, 1907.	May 16 to Oct. 21, 1908.	May 9 to Oct. 5, 1909.	May 17 to Oct. 29, 1910.	May 6 to Nov. 5, 1911.	June 13 to Oct. 26, 1912.	June 1 to Sept. 30, 1911.	May 8 to Sept. 22, 1912.
22	2	......	......	......	0	......	......	......	......	......	......	......	......	......
28	2.5	......	......	......	6	......	......	......	......	......	......	......	......	......
33	3	0	......	......	14	......	......	......	......	......	......	......	......	......
44	4	13	......	0	22	......	......	......	......	......	......	......	......	......
55	5	16	......	14	25	0	......	......	......	......	......	......	......	......
66	6	29	......	29	36	12	......	......	......	......	......	......	......	......
77	7	39	0	34	45	21	......	......	......	......	0	......	0	......
88	8	47	2	37	54	32	......	......	0	0	4	......	3	......
99	9	52	4	39	62	39	......	......	2	2	11	......	7	......
110	10	56	19	45	67	49	......	......	5	3	24	......	13	......
132	12	69	35	47	71	64	......	......	17	22	30	......	20	......
154	14	73	57	54	74	75	0	......	26	40	41	0	23	......
176	16	77	58	64	76	85	5	0	27	49	44	3	24	......
198	18	78	65	69	77	90	17	5	39	55	59	16	29	0
220	20	82	66	79	79	98	27	27	46	60	66	31	32	8

HYDRAULIC METHODS.

The methods of mining that have been practiced in the Yukon-Tanana region have not as a rule required the use of large quantities of water under pressure.

Several small hydraulic plants have been installed, but the value of the gold recovered by such means is relatively small. They are briefly described in connection with the basins in which they are located.

Nearly all the areas now being worked by hydraulic methods are creek deposits in which the gold-bearing gravel lies at shallow depths. The bench deposits so far known are few and small. The gradients of the bedrock that underlies the creek deposits are invariably too low to permit hydraulicking without elevating the gravel. Hydraulic elevators require about twice as much water to raise the gravel as is needed to deliver the material to it. A few small ones have been installed and operated in this region, and without exception they have proved unsuccessful. A system of raising the gravels to the sluice boxes that is now being practiced by three plants in the Birch Creek basin has been found to be superior to elevators, at least under the conditions in that section. The plant on Mammoth Creek, the largest of the three, was described in a previous report[1] as follows:

Mammoth Creek has a very low grade, and in order to overcome this difficulty a plant was installed which is novel in Alaska but is identical in principle to the one installed on Eagle Creek in 1908. The general plan of operation is as follows: First, a bedrock drain is excavated to dispose of the water in the cut and to carry away the overlying muck, which is hydraulicked off from the gravels to be handled by the first set-up. A channel is then groundsluiced back of and above the cut and opposite the hydraulic giants. In this channel substantially constructed sluice boxes (with block riffles), similar in design to those ordinarily used in hydraulicking, are set up with a grade depending on the character of the gravels to be washed. A sheet-iron back stop about 10 feet high is then erected back of and against the boxes. The auriferous gravels are driven directly by the water from the nozzles of the giants against the back stop, from which they drop into the sluice boxes. A gravel incline is formed in front of the boxes by the stream of water as soon as operations are begun, and for this reason the force of the moving gravel is not expended against the sides of the boxes. The water for transporting and washing the gravel, after it is dropped into the boxes, is diverted from the creek about 1 mile above and carried in a ditch to the head of the sluice and after passing through is carried away in the bedrock drain. The tailings which accumulate at the end of the sluice are "piped" back out of the way by a separate giant set up at any convenient place. It is not ordinarily necessary to operate this giant continuously. The frequency with which the tailings have to be moved depends on the dumping room at the end of the boxes and the rate at which the gravel is being moved. This process does, however, require a quantity of water which should be taken into account in considering the supply necessary for such a system.

This method is especially adapted to working creek deposits with medium depths of gravel, where the slope of the bedrock is insufficient to permit the removal of the tailings by gravity. It has several advantages over elevators. The initial expense is less and the water required is less. No such heavy parts are required, which is an important item, especially in the more remote districts, where transportation is always expensive and often uncertain. The cost of set-ups is not as great and the chances of delay incident to repairs and replacement of parts are no greater than in ordinary hydraulicking.

The system includes about 10 miles of ditch (see p. 182), the longest in the Yukon-Tanana region. Many other ditches have been built,

[1] Ellsworth, C. E., Placer mining in the Yukon-Tanana region: U. S. Geol. Survey Bull. 442, pp. 236-237, 1909.

but they are relatively small and experience in such work has been rather slight.

On Seward Peninsula over 400 miles of ditch with a capacity of 20 second-feet or greater has been built. Frozen ground has caused serious difficulties there as well as in the Yukon-Tanana region. (See p. 183.) Methods of construction and means of overcoming difficulties have been described by Henshaw and Parker[1] as follows:

Ditches are constructed by several different methods, according to the conditions of the ground encountered. Horses have been used for the work wherever possible. In one method the ground is first prepared by removing the moss and turf from a strip 40 or 50 feet wide on either side of the ditch. This should be done, if possible, the summer before actual construction is begun, in order that the ground may thaw more readily. Actual construction begins with plowing, after which some of the material is moved with a grader from the upper side of the ditch to the lower bank until a practically flat bench is produced. The cut is then excavated with horse scrapers down to grade, and the material piled up on the lower bank. The ditch is finished by hand, and both bottom and bank are trimmed to an even grade and alignment. The method above described is practicable where the ground contains only small or medium sized rocks and is about the cheapest and most rapid that can be used, but it requires exceptionally favorable conditions to make it a success. Where the ground is naturally unfrozen or can be made to thaw easily, and where other conditions are similar to those encountered in a temperate climate, no difficulty is experienced.

Wherever the ground is frozen muck, or so-called glacier, it melts rather slowly when exposed to the air, and the work of excavation must be done by hand while it thaws. The best practice is to keep exposed as large an area as possible and to remove the soil in thin layers. Practically all of the ditches north of the mountains were built by this method.

More or less rock work has to be done on all ditches. Some of them have had to pass around cliffs of practically solid rock where the construction required a large amount of blasting. Rock cuts offer no problems not met in other fields except in the method of making the ditch tight, which is done by the use of a peculiarly tough and tenacious sod abundant in many places in the north. The sod is cut with mattocks into pieces 1 to 2 feet square and placed in the ditch, bottom up. Two layers are usually placed in the bottom, breaking joints as well as possible, and the whole is carefully and solidly tamped into place. The sides of the ditch are made tight with a sod wall, the pieces being laid one above another, bottom up. Where the sod is above the water line part of the time, the grass usually continues to grow and its living roots bind the material more closely and firmly together. The best sod, and the only kind which fully meets the requirements, is that containing grass roots and very little moss, for the moss is less tenacious and decays more rapidly. Grass, however, is not abundant in many places, and it is therefore often necessary to use sod of inferior quality, with correspondingly unsatisfactory results. For example, on the Fairhaven ditch there is a great deal of rockwork and much frozen ground which becomes very soft on thawing, and a great deal of sod was needed. Sod could be found only in small isolated patches, and much of it had to be taken from the river bottoms far below the line of the ditch at considerable expense. In the Kougarok region, however, sod is fairly abundant and has been used very freely, and in southern Seward Peninsula sod of a good quality can usually be found.

[1] Henshaw, F. F., and Parker, G. L., Surface water supply of Seward Peninsula, Alaska: U. S. Geol. Survey Water-Supply Paper 314, pp. 258–260, 1913.

Canvas has been used in some places to line ditches, but it is expensive and is reported to be not wholly satisfactory. If it is disturbed after it is once laid down, it is likely to be torn, in which event it becomes practically useless.

In ground composed largely of frozen muck or ground ice special methods and precautions must be used. This material when it thaws leaves a soft residue, largely mud and decomposed vegetable matter, which may be only 20 or 30 per cent of the original volume. Water flowing across such material causes it to thaw rapidly, and consequently when a ditch is built through it precautions must be taken to prevent too much thawing. Where the muck is present the portion nearest the surface usually contains much more earthy matter than that just below, and in many places there is a layer of blue clay just beneath the moss. The vegetable matter close to the surface is also less completely decayed and therefore more solid and tenacious than that lower down. If this surface covering is allowed to remain in place and the ditch built over it by building up the lower bank with sod and with material stripped from the top, good results can usually be obtained. When the stripping is carried to just about the right depth, the water, after being turned into the ditch, will cause the ground to thaw a little. The bottom will settle a few inches, and then the ditch practically builds itself, so that eventually the water is carried in a section entirely below the surface of the ground, and the ditch can not leak, because its sides are all soft, finely divided material, mostly muck and clay, backed by solid and impervious frozen ground. These ideal conditions are generally aimed at by ditch builders, but are attained only at certain localities and by special care in building and watchfulness in maintaining the ditch.

Most of the Fairhaven ditch was built in 1906, before builders had gained much experience with ground of this character. Through most of its course it passes over ground that generally is permanently frozen. The ditch was built under a contract which called for a cut of 12 inches below the ground surface of the lower bank, and the contractors were held rigidly to the specifications. As a result, all the surface covering was removed, and the ditch bottom was made in frozen ground containing only a small percentage of solid material. When the water was turned in this frozen muck thawed and the ditch settled in some places 3 or 4 feet. The material thus melted yielded enough solid matter so that in many places a fairly good bottom resulted and the thawing did not progress any farther. At other points the ditch bottom practically sank "out of sight." The water cut under the lower bank and bad breaks resulted.

The Candle ditch * * * was built in a drainage basin adjacent to that in which the Fairhaven ditch is located and encountered much ground of a similar character, but apparently containing a somewhat higher percentage of solid matter. It is smaller than the Fairhaven ditch and was built with a cut on the lower bank of about 8 or 9 inches. This ditch has settled in a great many places, but when the writer last visited it, in 1909, it was on the whole in somewhat better condition than the Fairhaven ditch. In one section where the ground had cut badly the ditch had evidently been given an excessive grade, and the water attained a velocity sufficient to scour away the fine material as it thawed. As a result a deep cut was eroded; and only the fact that this occurred on flat ground prevented a bad break.

The necessity of keeping the grade of the ditch and the velocity of the water low in ground of this character is very important and can not be too strongly emphasized. The Fairhaven ditch was laid out with a grade of 4.22 feet to the mile, and as it was designed to carry water to depths of 2 feet or more the resulting velocities were rather high, a condition which contributed in no small degree to the cutting that resulted in the soft ground. The grade of the Candle ditch was only 3.69 feet to the mile and the ditch itself is of smaller dimensions, so that the resulting velocities were lower and the difficulties encountered correspondingly less.

In many places a ditch in ground of this character should not be given a grade greater than 2½ feet to the mile. The ditch can be built wide and with a shallow cut. It will then "make itself" at a very small expense, and the low velocity resulting will tend to give a permanent and satisfactory waterway.

The Miocene ditch is described as follows:[1]

One of the most notable examples of successful flume construction over frozen ground that has been seen by the writer is that on the Miocene ditch. This flume is 1,100 feet long and has a width of 8 feet and a depth of 28 inches. It was constructed in 1901, and until 1906 or 1907 it retained practically perfect alignment, both horizontal and vertical. No extensive repairs were necessary on it until 1909. In putting in the foundation trenches were dug 3 or 4 feet in the frozen ground, which was practically all ice. A sill was laid in the bottom of the trench and the uprights fastened to this sill. The excavated material was then replaced in the trenches and allowed to freeze again into its original condition. Sod was carefully placed over the trench, the uprights were then sawed off to grade, and the flume constructed on them. Even with all these precautions, however, at the end of about eight years the flume was in such bad shape that extensive repairs had to be made.

Seepage losses[2] on ditches in Seward Peninsula have been found to be a serious factor and should be taken into account in planning a water supply. The average loss per mile under varying conditions of supply, size, character of ditch, and climate was about 0.5 second-foot. The actual loss per mile varies from almost no loss at all to as much as 1 second-foot and in a few places where unusually porous soil was encountered to even greater amounts.

CONCLUSIONS.

Scope.—The conclusions of this report in regard to the water supply and factors controlling it in the Yukon-Tanana region are summarized below. They are only intended to present concisely the general conditions in this region and are necessarily incomplete. They represent the writer's interpretation of the available data and the natural conditions and for a more comprehensive presentation one is referred to the published records and the discussions thereof.

Topography.—Characteristically, the region is a dissected upland. From a distance it appears hilly or mountainous, but in reality its predominating feature is a series of long branching ridges of remarkably uniform elevation.

This kind of topography is essentially unfavorable for mining purposes—first, because of the small catchment area above the diversion point of the stream on which the mine is located; second, because of the absence of large adjoining basins lying above the general level of the mines from which the immediate supply can be augmented by reasonable length ditches or pipe lines; third, because of the absence of natural storage basins; and fourth, because of the low uniform stream grades.

[1] Henshaw, F. F., and Parker, G. L., op. cit., p. 262.
[2] Idem, pp. 263–269.

Temperature.—The temperature is characterized by extreme ranges, both annual and monthly. Summer temperatures above 90° and winter temperatures below $-70°$ have occasionally been reported. The mean monthly temperature is below 32° for seven months of the year, and a large portion of the area is permanently frozen to great depths. This condition is an obstacle to ground storage, for it tends to cause the rainfall to run directly into the streams, resulting in a less uniform distribution of the run-off, and consequently a very "flashy" and widely fluctuating stream flow almost directly dependent upon precipitation. Because of the low temperatures the evaporation is probably much less than in the more southern latitudes.

Precipitation.—The estimated mean annual precipitation of the region is about 12 inches. The annual precipitation at a certain point varies between relatively wide limits as does also the precipitation at different points for the same year. Approximately 60 per cent of the annual precipitation falls during the four months, June, July, August, and September, in rather light general rains and frequent small showers. The favorable distribution of the rainfall is largely counteracted by its small amount and by various unfavorable conserving factors.

Vegetation.—The average elevation of timber line is about 2,500 feet above sea level. Spruce is the most common, and in the valley bottom near the watercourses much of it attains diameters of 18 to 24 inches. Back from the watercourses and on the valley slopes it is usually stunted and is seldom suitable for milling, but has furnished a fair supply for fuel. White birch is common on southern slopes at low elevations, and small stands of cottonwood are found along many of the larger streams. Dense growths of alder and willows fringe the smaller streams and occupy the higher gulches and ravines.

The supply of wood suitable for fuel or lumber has been greatly depleted by fires and near the centers of development is being rapidly exhausted by industrial uses.

The amount of moisture absorbed by vegetable growth is probably less than in more southern latitudes. Normally the ground is nearly everywhere covered by a thick mantle of moss, which, where not destroyed by fire, undoubtedly aids in regulating the stream flow.

Water supply.—The water supply or run-off is a function of several factors, the more important of which are precipitation, temperature, topography, vegetation, and evaporation. In the Yukon-Tanana region the stream flow resulting from these factors is generally unfavorable for hydraulic development. The winter supply is entirely inadequate for any mining, except perhaps for working small lodes. In fact, on many of the streams it is practically nil. In summer the stream flow fluctuates widely, with a great sensitiveness to the rainfall, so that during periods of deficient rainfall the run-off becomes relatively very low. This characteristic is of great practical importance because thereby the controlling consideration in most hydraulic development in this region becomes the question of the minimum flow. The records of minimum weekly run-off in second-feet per square mile from representative drainage areas have been summarized and discussed on pages 325 and 326, and they are worthy of careful study.

Water power.—The conditions of the Yukon-Tanana region are particularly unfavorable for the development of water power. The combinations of low minimum run-off (see p. 326) without natural storage or favorable means of developing artificial storage, of low and uniform stream grades, of short seasons, and of variable market make the use of water power a last resort.

Hydraulic mining.—The uniform topographic features, low minimum run-off, lack of storage facilities, and low stream gradients, just indicated as the principal objection to the development of water power, are probably of more serious consequence in hydraulic mining because for such uses the point at which the water must be delivered under pressure is wherever the gold occurs, whereas water power may be generated many miles from where it is to be used and transmitted in the form of electric energy.

There may be gold deposits in this region that can be recovered more economically by hydraulic methods than by other means, but the two most important factors in the operation of a hydraulic plant are not naturally available. The first requirement, an ample water supply under a sufficient head, is everywhere expensive and in some localities is practically impossible to obtain. The second and almost equally important factor, a natural stream grade sufficient to remove the tailings without elevating the gravel, is nowhere available except for bench deposits, which so far as known are of minor importance in this region.

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Triangulation and topography by E.C. Barnard.
Surveyed in 1898
Corrections for geodetic position and for topography along international boundary supplied, 1909-1911, by the Alaska Boundary Survey.

Scale $\frac{1}{250,000}$

Contour interval 200 feet.

Datum is mean sea level, estimated.

Recent determinations by Alaska Boundary Survey indicate that elevations are about 275 feet too low.

TRUE NORTH
MAGNETIC NORTH
36°
APPROXIMATE MEAN DECLINATION 1909.

LEGEND

× G Rainfall station; letter refers to list in text.
O 2 Gaging station; number refers to list in text

RECONNAISSANCE MAP OF THE FORTYMILE QUADRANGLE, ALASKA

SHOWING LOCATION OF RAINFALL AND GAGING STATIONS

1914


RECONNAISSANCE MAP
OF THE
CIRCLE QUADRANGLE, ALASKA
SHOWING LOCATION OF RAINFALL
AND GAGING STATIONS
Scale 1/250,000
15 Miles
20 Kilometers
Contour interval 200 feet
Datum is mean sea level,
assuming an elevation of 810 feet at Eagle
Dotted lines represent probable topography, unsurveyed
Alfred H. Brooks, Geologist in charge of division.
Topography by T.G. Gerdine, D.C. Witherspoon,
R.B. Oliver, J.W. Bagley,
and G.T. Ford.
Triangulation by
T.G. Gerdine and D.C. Witherspoon.
TRUE NORTH
MAGNETIC N.
34°11'
LEGEND
Rainfall station; letter refers to list in text
Gaging station; number refers to list in text
1914
YUKON
RIVER
CRAZY MOUNTAINS
Circle
Twelvemile House
Boulder Hill
Central House
Hot Springs
Medicine Lake
Mastodon Dome
Twin Mt
Mt Sorenson
Arctic Dome
West Point
The Splits
CHENA
SALCHA
NORTH FORK
GOODPASTER
CHARLEY
TANANA
DELTA
Shaw
Volkmar
Healy
Mt Veta
Kechumstuk
Birch Creek
Coal Creek
Copper Creek
Seventymile
MIDDLE FORK
FORTYMILE
(Fairbanks Quadrangle)
(Fortymile Quadrangle)

Alfred H. Brooks, Geologist in charge of division.
Topography and triangulation by T. G. Gerdine,
D. C. Witherspoon, R. B. Oliver, J. W. Bagley, and D. L. Reaburn.
Surveyed in 1902, 1903, 1905, 1906, 1907, 1908, and 1910.
Geodetic position from Astronomic Station at Fairbanks, by Coast and Geodetic Survey.
Note: Positions north of 64°20' and Tanana River are approximately 7" too far west.

TRUE NORTH
MAGNETIC NORTH
29°
APPROXIMATE MAGNETIC DECLINATION VICINITY OF FAIRBANKS 1903

RECONNAISSANCE MAP OF THE FAIRBANKS QUADRANGLE, ALASKA

SHOWING LOCATION OF RAINFALL AND GAGING STATIONS

Scale $\frac{1}{250,000}$

5 0 5 10 15 Miles

5 0 5 10 15 20 Kilometers

Contour interval 200 feet

Datum is mean sea level assuming an elevation of 810 feet at Eagle

Dotted lines represent probable topography unsurveyed

1914

ENGRAVED AND PRINTED BY THE U.S. GEOLOGICAL SURVEY

LEGEND

× J Rainfall station; letter refers to list in text

○ 85 Gaging station; number refers to list in text

152°20' 152°00' 40' 20' 151°00' 40' 20' 150°00'

Alfred H. Brooks, Geologist in charge of division
Topography and triangulation by
D. C. Witherspoon and R. B. Oliver
Surveyed in 1906
Geodetic position from astronomic station at Tanana. All positions, however, shown too far south, the error in latitude ranging from 18 seconds at the eastern edge to 35 seconds at the western

RECONNAISSANCE MAP OF PART OF RAMPART QUADRANGLE, ALASKA

SHOWING LOCATION OF RAINFALL AND GAGING STATIONS

TRUE NORTH MAGNETIC NORTH
APPROXIMATE MAGNETIC DECLINATION HOT SPRINGS, 1906.

Scale $\frac{1}{250000}$

5 0 5 10 15 Miles

5 0 5 10 15 20 Kilometers

Contour interval 200 feet.
Datum is mean sea level assuming an elevation of 810 feet at Eagle.
Dotted lines represent probable topography, unsurveyed.
1914

LEGEND
× M Rainfall station; letter refers to list in text
○ 80 Gaging station; number refers to list in text