PLACER MINING IN THE YUKON-TANANA REGION.

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INTRODUCTION.

It is the object of this report to give a brief summary of the general progress of placer mining in the Yukon-Tanana region during 1910. The writers were engaged in a water-supply investigation of the Fairbanks, Circle, Tenderfoot, Eagle, and Seventymile placer districts of the Yukon-Tanana region, and incidentally some notes on mining operations were made. Much of the material embodied in this report, however, is due to information furnished by mine operators and others personally familiar with the conditions in the several districts.

The decrease in the value of the gold production of the Yukon-Tanana region from $10,720,000 in 1909 to $7,100,000 in 1910 can be attributed almost entirely to the drop in output from the Fairbanks mines, which in turn was due mainly to the fact that many of the richer placer deposits so far located have been worked out, although several other reasons of less importance contributed to the decrease. Every camp in the region furnished to a greater or less degree its quota of men and capital to the Iditarod district, and the increased interest taken in lode mining also drew many men away from the placers. There was also experienced in July and August the most severe drought that has occurred during that season since the beginning of water-supply investigations in this region in 1907. The successful operation of placer mines is so dependent upon the water supply that a shortage in that most important factor will inevitably result in a corresponding decrease in gold output.

FAIRBANKS DISTRICT.

GENERAL CONDITIONS.

The marked decrease in production in this district from $9,650,000 in 1908–9 to $6,100,000 in 1909–10 is due to several causes, chief among which is the fact that many of the richest pay streaks have been worked out. New discoveries and the tracing of old pay streaks have not furnished new ground sufficient to offset the amount worked out during the previous years. In other words, the district is reaching the stage in its development that lies between the exploitation of the rich bonanzas and the installation of machinery for large-scale operations which make for economy in extracting the gold from the gravels. This period of decline is experienced by most placer camps, and the interval of lower production will be long or short according to the difficulties met in making a thorough investigation of conditions and in perfecting organizations for the purpose of applying equipment best suited to the recovery of gold from gravels carrying low values. The exodus of men and machinery to the new Iditarod country also operated to cut down the annual output of the district, for many experienced miners transferred their funds and personal attention to the new placer camp. It was estimated that 1,000 men followed the ice down the Yukon to the new strike and, although many returned later, a disquieting effect was produced which was felt throughout the season.

The scarcity of water for sluicing necessitated the closing down of a number of plants and a reduction of the force employed at many others. The data secured during the summer at a number of stations on streams in the district (see p. 181) indicate a relatively lower run-off during July and August than has been recorded for any year since stream-flow investigations were begun in this section, in 1907. Still another reason for the decrease in the gold output may be the greatly increased activity in prospecting and developing quartz lodes in this vicinity, which has diverted the efforts and capital of a considerable number of experienced operators from placer mining.

Mining methods and conditions were practically the same as in previous years, and no great advance was effected in reducing the high cost of working the gravels, but some steps were taken to develop dredging ground. It is estimated that in 1910 between 1,300 and 1,400 men were employed in actual placer mining in the district on about 140 claims.

GOLDSTREAM BASIN.

During the winter of 1909–10 and the summer of 1910 Goldstream Valley presented a lively scene of mining operations from a point near the head of Pedro and Gilmore creeks to "No. 17 below." Open-cut methods were used extensively in the upper portion of the valley, where the depth of the ground permits working in this manner. Two large open-cut plants, one on "No. 9 below" Pedro and the other on "No. 5 below" Goldstream, operated bottomless scrapers successfully. It is reported that the cost of working the ground was less than 30 cents a square foot, which is low for the Fairbanks district. Several other smaller plants operating on Pedro Creek also proved the economy of the open-cut method of mining. The usual practice of drifting and hoisting was employed exclusively on lower Goldstream and Engineer creeks. Probably 90 per cent of the production of the Goldstream Valley was secured in this manner. In size the plants ranged from a hand windlass worked by 2 men to a 60-horsepower steam plant employing 40 men. Some difficulty was experienced on Engineer Creek with thawed ground and underground water, but the most serious drawback of the season in this basin resulted from the scarcity of water for sluicing. Several of the mines working on low-grade gravel were compelled to shut down entirely on this account, and a number of others were not able to work a full force during the low-water period.

Successful prospecting on the second tier of benches on the left side of Goldstream, opposite "No. 8 below," early in the spring led to the development of a good pay streak extending over three claims opposite "Nos. 7, 8, and 9 below" later in the season. Considerable prospecting was done during the summer and is still being done to trace the pay gravel farther up and down stream. Bedrock on the second tier and creek claims is at about the same elevation, but the pay streak above the former seems to be of a uniformly higher grade than in the creek bed. The depth of ground, however, is somewhat greater on the bench claims, as the average depth of hole is between 100 and 110 feet. It is estimated that 500 men were employed in placer mining on 52 claims on Goldstream, Engineer, Pedro, and Gilmore creeks during the winter season and probably about 20 per cent more were working during the summer months.

CHATANIKA RIVER BASIN.

Cleary Creek.—A large percentage of the annual gold production of the Fairbanks district continues to come from Cleary Creek, which has produced more gold than any other creek in the Yukon-Tanana region. The settlement of the legal status of "Nos. 4 and 5 below" in 1909 made it possible to resume working in the richest part of the creek. The large plant on "No. 5 below" employed between 50 and 60 men. Practically all the claims from "No. 10 above" to "No. 17 below" on Cleary were being worked during the winter, and in the spring there were between 40 and 50 large dumps to be sluiced with the spring run-off. The summer operations, though not so extensive on the upper portion of the creek, were of greater magnitude than those of the winter season on the lower portion. This was largely brought about by the Chatanika ditch, which furnished eight operators with all the water that was needed for sluicing. Several of the operators made use of electrical energy supplied by the Poker Creek power plant for pumping the water from the ditch to their sluice boxes set at a higher elevation.

Wolf Creek, which was prospected rather thoroughly in 1909, began to yield good returns in the spring of 1910. Both open-cut and drifting methods were employed in extracting the gold. The success attained by several small outfits engaged in "sniping" during the summer drew attention to the possibility of profitably working over the old tailings. It is conceded that the ground on Cleary Creek is of too great depth to work by hydraulic methods; but it is thought by local men that the gold remaining in the tailing piles amounts at least to 10 per cent of the quantity already recovered and that it might prove profitable to resluice the tailings with suitable appliances if the water from Chatanika River could be diverted to the ground at sufficient elevation and at a cost to warrant such an undertaking.

On Cleary Creek and tributaries between 45 and 50 outfits were working on about 30 claims during the winter.

Dome Creek.—A great decrease in mining operations was shown on Dome Creek, which has held a very prominent position among the producing creeks in past years. This is due chiefly to the exhaustion of the richest claims; but the fact that several of the claims are tied up in court proceedings is also an important factor. There were six or seven plants being operated between "No. 7 above" and "No. 7 below," of which only two on "Nos. 5 and 6 below" were working on a scale comparable to past operations. The extreme drought also added to the difficulties on this creek. It is said that there was scarcely enough water to supply a boiler on "No. 6 below" during the low-water period, where in former seasons there was very seldom less than a sluice head available. Further prospecting this year between "No. 7 below" and "No. 14 below" has failed to locate the "lost" pay streak in this part of the creek.

Chatanika Flats.—On lower Dome Creek, in the Chatanika Flats, the successful operation of a plant on the Niggerhead group and prospecting on the lower end of the group has defined a body of pay gravel at a depth of 180 feet which carries good values. Prospecting is also being done on the Recorder Association claim, which is just above the Niggerhead group and extends up Chatanika River, on the assumption that the pay comes from the river rather than from Dome Creek. Mining was being carried on at the mouth of Vault Creek on the Alabama Association claim, and about 4 miles below this point, near the mouth of Sargent Creek, gravel was being taken out from a 150-foot face which is 230 feet below the surface of the ground. The values are found on a false bedrock consisting of an impervious clay which is 89 feet above the real bedrock. It is thought by some of the miners that the developing and prospecting that have been done along the Chatanika Flats indicate a continuous pay streak from the mouth of Cleary down to Our Creek.

Little Eldorado Creek.—It is reported that a 20-ounce gold nugget was found in one of the clean-ups of a plant on the Idaho group of

Little Eldorado Creek. Considerable money was spent in prospecting on this creek last year without adequate results.

Homestake Creek.—The shallow gravels of the tributaries at the head of Chatanika River are suited to the method of hydraulicking in vogue in the Circle district. The small hydraulic plant installed on Homestake Creek this spring was in readiness for "piping in" early in July, and a good showing was made, considering the drawback that was experienced through low water. The water was diverted from Homestake Creek near its head and conducted by ditch and hydraulic pipe for about 3 miles along the right side of the creek to a point near the mouth, where mining operations were begun. The head attained is 160 feet and the depth of gravel to be worked averages about 8 feet.

CRIPPLE CREEK BASIN.

Ester Creek.—Mining operations are decidedly declining on Ester Creek, which in past years has yielded a percentage of the total production in the Fairbanks district second only to Cleary Creek. This is due principally to the fact that most of the richest portions of the creek have been worked out, but the lack of sufficient water for sluicing on Ready Bullion and upper Ester during the period of drought is also a contributing cause. The scheme of winter sluicing which was mentioned in last year's report was employed by three plants on Ready Bullion that were working in thawed ground. The plant on "No. 3 above first tier," which operated continuously during the winter, was visited by the writers early in the spring. A brief description of this plant will be given, as it affords an example of mining by the combination of thawed-ground and winter-sluicing methods. This is an unusual practice, for either condition is thought to considerably increase the cost of working ground. A 100-foot shaft to bedrock was joined by a system of tunnels, extending parallel and perpendicular to the course of the creek, which blocked out the gravel to be worked into 50-foot squares on the bedrock level. The supports for the small spruce pole shoring used for supporting the weight of the gravel consisted of uprights about 5 feet long and caps about 6 feet long hewed from spruce timber 10 to 12 inches in diameter. These were set 4 feet apart so that the poles, which were 8 feet long, could be driven ahead as the work on the face proceeded. It was not found practicable to pull this timbering, although the blocks farthest from the shaft were worked first and the ground was allowed to settle behind the working face. The gravel was conveyed from the face to the bucket hoist on cars of six wheelbarrows capacity, running on rails. A 3-inch pump kept the mine drained and by turning the exhaust into the sump hole warm water was furnished for sluicing. The exhaust from the steam hoist was conducted along the bottom of the sluice boxes by use of canvas cover and aided materially in keeping the temperature above the freezing point. The sluice water drained from the tailing pile into a stilling reservoir and was again warmed by the exhaust from the pump, which raised it to a flume. The water was led back to the sluice boxes through this flume and was there joined by more water from the drain pump in the mine to begin a new circuit. No difficulty was experienced in operating, even when the thermometer stood at 60° below zero. It is interesting to note that the cost of working ground in this manner was claimed by the operators to be about 75 cents a square foot on a basis of weekly running expenses, not, however, taking into account interest, depreciation, etc. Sixty men were employed and between 5,000 and 5,500 square feet of bedrock was worked out weekly.

Winter operations on Ester Creek proper consisted of blocking out ground for summer work and taking out dumps to be washed up in the spring. It is estimated that there were about 200 men employed on about 17 claims of Ester Creek and tributaries during the closed season. No data are available for estimating the summer work, but it is thought that it was not nearly so extensive. The largest plant of the creek, working on "No. 3 below" and employing about 60 men, was compelled to discontinue work during the later part of the season on account of the laborers demanding $6 a day instead of the customary wages of $5 a day.

Prospecting opposite "No. 6 below," 1,500 feet to the right of the present pay streak, brought to light some very rich coarse gold prospects which are similar to the gold found on the right side of "No. 2 below." As this gold is very unlike the finer values found in the creek claims, further prospecting is under way to determine whether there is another old channel, curving to the right, which carries this coarse gold.

St. Patrick, Emma, and Alder creeks.—Very little actual mining was done in 1910 on St. Patrick, Emma, and Alder creeks, which are small tributaries of Cripple Creek.

FISH CREEK BASIN.

Fairbanks Creek.—Fairbanks Creek, though not a large producer, has yielded a steadier annual output than any other creek in the district. Mining by both open-cut and drifting methods was carried on from "No. 10 above" to "No. 11 below." Six or seven open-cut plants were in operation, most of which employed bottomless scrapers for stripping the ground and steam hoists for carrying the gravel to the sluice boxes. On "No. 3 below" a 45-horsepower bottomless scraper, having a capacity of 2½ cubic yards, was in use. There were a number of small operators employing a windlass for taking out the pillars and walls of gravel that were left in ground previously worked by larger plants. The scarcity of water in July and August made it necessary for several of the plants to work alternately day and night, so that the total flow of the creek could be utilized by each plant. Winter sluicing, which has been successfully conducted during the last two years, will be employed again this winter by three of the operators. Prospecting on "No. 11 above" in former years had been confined chiefly to the left side of the claims, but in 1910 some very good values were obtained in holes sunk on the right side. Crosscuts were run and further prospecting carried on during the later part of the summer to determine the extent of the high-grade gravel, but it was not learned what success attended these efforts. Summer development and prospecting has also resulted in the location of a body of gravel carrying values on claims of lower Walnut Creek and on the adjoining left-limit bench claims opposite "Nos. 1 and 2 below" of Fairbanks Creek. It is estimated that about 135 men were employed on 20 claims in this drainage basin during both the winter and summer seasons.

In the past there have been several large-scale plans under consideration which involved the use of a dredge for working the ground on Fairbanks Creek, and options on claims have been taken with that end in view, but so far as known nothing definite has been done toward putting these plans into effect. A number of owners are securing patents to their claims which insure absolute title and will simplify their relations with a dredging company, if one is organized.

Fish Creek.—A decided increase in mining operations has taken place on Fish Creek during the last year, and developments this summer seem to indicate that it will remain on the productive list for some years to come. A number of operators on the upper part of the creek who took out winter dumps were very agreeably surprised when their clean-ups netted more than they were expecting. This was due largely to the presence of coarse gold, which had not been found to any great extent in prospecting. It is reported that a $43 nugget was found in the spring clean-up of "No. 5 above," and later in the season the operators on "No. 2 above" are said to have taken out a nugget valued at $84.25. Previous to this spring it was thought that Fish Creek would produce chiefly fine gold.

Mining was being done on almost every claim from "No. 10 above" to "No. 2 above" by both open-cut and drifting methods. "Nos. 2 and 3 above" yielded the best returns for the summer season. Below "No. 2 above" there was some prospecting done, without success, in trying to locate a pay streak between this claim and "No. 8 below," where one outfit, employing four men, was occupied in drifting in gravel carrying fine gold. About 35 men were employed on eight claims during the winter, and it is probable that about 50 men were employed during the open season.

CIRCLE DISTRICT.

GENERAL CONDITIONS.

The success of the small hydraulic plant on Eagle Creek and the fact that Mammoth Creek has been put on a productive basis through the satisfactory operation of the larger plant installed there during the summer of 1909 has given an added impetus toward hydraulicking in this district. The character and depth of gravel and the nature of the bedrock of portions of the stream carrying values are favorable to this method of mining, provided sufficient water can be had at an effective head. The gradient of the streams, however, is not sufficient for disposing of the tailings without some system of stacking. A giant is used for this purpose in connection with the two plants mentioned above, which necessarily calls for an additional supply of water. In this district there are four or five projects under consideration which entail the use of water under a head for their development, and it is hoped that two of these will be in operation before the close of the season in 1911.

The economy attained in moving gravel by the two plants now in operation during the extremely dry season of 1910 and at relatively high elevations lends encouragement to those who look forward to mining the low-grade gravels in the Birch Creek bars and along Preacher Creek with the considerable volume of water which would be available for that purpose. It should be borne in mind by those contemplating the installation of plants that this district embraces an area of low run-off, and accordingly the water supply available for each project should be carefully determined.

A renewed interest in locating new pay streaks has been brought about by the small strikes on Bottom Dollar and Frying Pan creeks, and if the summer operations on Buckley Bar of Birch Creek proper prove successful doubtless attention will be again directed to this field of endeavor.

The transportation facilities for summer traffic were not greatly improved this season on account of lack of funds. The only substantial improvement in the roads consisted of laying corduroy across the Albert Creek swamp, which separated the Government road, as completed in 1909, from the Central House. The dry weather, however, made it possible to haul larger loads over the unimproved trails from Central House to Deadwood and Miller House than for a number of years in the past.

The district as a whole suffered somewhat from scarcity of labor during the fore part of the season, owing chiefly to the false report that there was a great need for laborers in the Fairbanks district and that wages there had been advanced to $6 a day.

CROOKED CREEK BASIN.

Mastodon Creek.—A livelier scene of small-scale mining operations was presented during the summer by Mastodon Creek, from "No. 7 above" to its head, than by any other part of the district. Here the depth of gold-bearing gravels is such that the open-cut method of mining is better suited for extracting the values than winter drifting. It is estimated that 85 men were employed in this section of the creek on 12 claims through most of the summer season, though only 16 men were working on about six claims during the winter. Two of the largest operators, employing about 25 men each, made use of bottomless scrapers for removing the overburden and bringing the gravel to the boxes. On "No. 21 above" a water wheel furnished the power for hoisting the gravel into the sluice boxes.

The title to the claims on the lower part of the creek from "No. 2 below" to "No. 7 above" has been secured by a company which proposes to divert water from Mastodon and Independence creeks for working the claims with small hydraulic elevators. A considerable part of this ground has been worked over during the last 10 years, but on account of the costly methods employed only the richest portions have yielded profits. The lower-grade gravels left at intervals in the creek bed and along the sides of the claims should net good returns if economical means of handling the gravel are provided. The company landed a 300-ton outfit, consisting principally of hydraulic pipe, at Circle before the close of navigation, and if plans are fulfilled the plant will be in readiness for operating early in June, 1911. As the quantity of water is an important factor to be considered, it is thought that the use of pipe for conveying the water to the elevator pits will make it possible to begin sluicing earlier in the season and that thereby a greater percentage of the spring run-off may be utilized. Furthermore, the pipe can be used again in other localities under similar conditions. "No. 6 below," upon which six men were employed, was the only claim that was worked on the lower part of the creek.

Mammoth Creek.—The largest hydraulic plant of the Yukon-Tanana region was in operation on Mammoth Creek. Here water was diverted from Bonanza and Porcupine creeks at an elevation of about 2,350 feet and 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, 6.5 miles long, was constructed in 1908 and put into good working order in 1909. A portion of the Porcupine branch of the ditch was dug in 1909 and the ground along the remainder of the ditch line was stripped of moss to allow the underlying frozen muck to thaw. Much difficulty was experienced in completing this section of the ditch last summer 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.

Operations on "No. 7 below" were carried on by the method of "piping in," a detailed description[1] of which has already been published. A head of 375 feet is available, but only 270 feet on bedrock was used. The completion of the Porcupine branch and the maintenance of the lower ditch kept 17 men busy during the summer and 14 men were employed at the mine. Low water proved to be the most serious drawback to the operations of the season. Data concerning the amount of water available at each intake may be found on page 200. Since a reservoir was not provided the method of sluicing intermittently, as practiced on Eagle, could not be employed on Mammoth. By reducing the size of the nozzle, however, it was found possible to work to an advantage during most of the low-water period, as only five days in July were lost through inadequate water supply. Frozen ground also offered considerable inconvenience, but doubtless the scheme adopted of stripping the gravel ahead of the pit a year in advance of operations will do much toward averting this difficulty.

Deadwood Creek.—Mining operations on Deadwood Creek during the winter of 1909 and summer of 1910, though handicapped on account of the low water, were about the same as in the previous two years. Here there seems to be no tendency toward adopting methods leading to a reduction in the cost of extracting the gold. The fact that most of the claims are worked by one to three men with pick, shovel, and hand windlass as the only labor-saving devices makes it evident that ground worked at a profit in this manner would pay well if more extensive equipment were provided. If the increased activity in hydraulicking in other parts of the district proves successful no doubt this method can be applied advantageously in working

[1] Ellsworth, C. E., Placer mining in the Yukon-Tanana region: Bull. U. S. Geol. Survey No. 442, 1909, p. 237.

the Deadwood deposits. The water supply available for this purpose above Switch Creek is stated on page 200. During part of the season good results were obtained from the operation of an automatic dam about a mile above Discovery claim. Considerable difficulty was experienced on the upper part of the creek with the "glacier," which formed on the claims during the winter to a depth of 15 feet in places and which did not disappear until late in July. Since there was very little water in Switch Creek after the spring thaw, operators were compelled to shut down work soon after the winter dumps had been sluiced. Information collected indicates that about 30 men were occupied in mining on 16 claims during the open season and that about 20 men worked 14 claims in the winter.

Independence Creek.—Mining on Independence Creek was carried on from "No. 5 below" to "No. 13 above" by 22 men working on six claims during the summer. Winter operations consisted of eight men drifting on six claims. Pick and shovel methods are used in working the deposits during both the open and closed seasons. It is reported that eventually the lower part of the creek will be hydraulicked by the company which has gained control of the lower portion of Mastodon Creek.

Miller Creek.—There were practically no mining operations on Miller Creek during the year. The ownership of all the claims from the mouth of the creek, "No. 7 below," to "No. 21 above" has come under the control of a company which proposes to build a ditch and work the ground with methods similar to those used on Eagle Creek. As the depth to bedrock is only 6 to 7 feet at the upper end of the creek and 12 to 14 feet on the lower end, little difficulty should be encountered in stacking the tailings. Owing to the meager water supply of Miller Creek (see p. 201) it will probably be necessary to provide a reservoir for storing the water so that it can be used intermittently during periods of drought, as is done on Eagle Creek. Ten men were employed during the later part of the summer stripping ground for a ditch, so that the large crew of men to be employed in the spring can carry the work on to completion. It is hoped that the plant will be ready to make use of the spring run-off in 1912.

NORTH FORK OF BIRCH CREEK BASIN.

Eagle Creek.—Hydraulicking on Eagle Creek was an experiment when first begun during the summer of 1908. The successful operation of the plant there during the last two seasons has shown conclusively that a small outfit and a small water supply can give good results when managed properly. It is estimated that ground carrying values as low as $1 a cubic yard can be worked to a profit with this method and under similar conditions—a fact which makes it evident that there are a number of deposits of gravel in the Circle district that would render good returns if this same means of exploitation could be employed.

The use of a small reservoir above the Mastodon Fork intake of the ditch made working on a small scale possible even during the excessively dry period in the middle of July, when the mean daily supply delivered by the ditch was probably less than 2 second-feet (80 miner's inches). The system used involved allowing the reservoir and ditch to fill and drawing on the storage thus supplied to operate the giants until both were emptied. It was only possible to work with about 500 miner's inches for two hours to the shift while the water was at its lowest stage. Seven men were employed to operate the plant during the summer.

Harrison Creek.—There were no operations on Harrison Creek proper during the last season, but it is reported that a hydraulicking project is being contemplated. Winter prospecting in 1909–10 on Bottom Dollar Creek and its tributaries, Half Dollar and Two Bit Gulch, resulted in locating some good prospects, and several small dumps were taken out which netted good returns when sluiced in the spring. It is understood, however, that the pay streak was found to be narrow and the gold contained in it irregularly distributed. Two men worked on the creek during the summer.

McLain Creek.—Two men were employed in operating an automatic dam on McLain Creek, which flows into Birch Creek just above Deadman Bar, but the work was hampered through lack of water. If a body of gravel of sufficient extent and of sufficient gold content can be located at this point to warrant the building of about 15 miles of ditch and to provide suitable hydraulic equipment, it is thought that an abundant water supply can be diverted from Clums Fork, which would give a working head at the mouth of McLain Creek of about 200 feet. A measurement of Clums Fork at the mouth on July 25, during a medium stage, gave a discharge of 118 second-feet (4,700 miner's inches).

Fryingpan Creek.—During the winter three prospectors located good values in a hole sunk to bedrock on the left side of Fryingpan Creek about one-half mile below the forks. The ground at this point is about 20 feet deep, comprising 15 feet of overburden and 4 or 5 feet of pay gravel. A small ditch was built and prospecting continued during the summer.

PREACHER CREEK BASIN.

The only mining done in the Preacher Creek drainage basin consisted of installing and operating an automatic dam on Bachelor Creek just below Costa Fork in the later part of the season. The scheme to work the Bachelor Creek gravels by the use of hydraulic lifts, which led to expending considerable money in partly constructing a ditch in 1909, has apparently been abandoned. It is reported that large bodies of low-grade gravel exist in the Preacher Creek valley below the mouth of Bachelor Creek which could be conveniently worked by some system of hydraulicking. A low-water measurement of 45 second-feet (1,800 miner's inches) above the mouth of Bachelor Creek seems to indicate that there is sufficient water for this purpose.

BEAVER CREEK BASIN.

Prospects were found in the upper tributaries of Beaver Creek which led to the staking of considerable ground long before the Fairbanks district was developed, but no actual mining operations were carried on in that vicinity. Desultory prospecting in later years seemed to indicate that the gold content of the gravel is very irregularly distributed and that it is not extensive enough to warrant any considerable outlay of capital.

During May, 1910, some good values were found, however, on Ophir Creek, a tributary to Nome Creek, which resulted in starting a small stampede about the middle of July. All of the ground in the Nome and Trail Creek drainage basins was staked, as well as that on several other creeks near by. Systematic prospecting followed in the wake of the stampede, and if reports are to be relied upon pay streaks have been located on Nome Creek above Ophir and on Ophir Creek near its mouth. Bedrock drains were being established on upper Nome Creek during the summer by an outfit which proposes to operate a bottomless steam scraper next season. The ground is all shallow, averaging about 15 feet deep, with 2 to 4 feet of pay gravel, so that open-cut methods will no doubt prove to be the cheapest means of recovering the gold. Ophir Creek, which flows into Nome Creek about 2 miles from its mouth, was the scene of the liveliest excitement during the stampede. On Discovery claim a 50-foot crosscut was run to determine the width of the pay streak, and it is stated that this was traced for a length of five claims before the close of the open season. The gravel carries coarse gold values at about $17 an ounce, and it is reported to run from $1.25 to $1.75 a square foot. The largest nugget found was valued at $4.30. Some very encouraging values were found on Trail Creek, which heads opposite Poker Creek, flows for about 15 miles in a northeasterly direction, and joins Beaver Creek about 6 miles below Nome Creek. Prospects were also found on several newly named creeks, such as Dominion Creek, Gold Mountain Creek, and Hoosier Creek, the locations of which were not learned by the writers.

There was much complaint registered against the laws which make it possible for one man, with the power of attorney from others, to stake association claims. It is said that 12 miles of creek was staked by one man in this manner.

HOT SPRINGS DISTRICT.

The value of the gold production in the Hot Springs district for 1910 is estimated to be approximately $325,000, which is the same as that estimated for 1909. The increased output from Sullivan and Cache creeks offsets the decrease from the Baker Creek mines.

It is understood that a large quantity of machinery has been shipped into the Patterson Creek basin, and the lack of capital, which has seriously retarded the proper development of the mines since the discovery of gold in this section in 1907, was not so marked during the last season as in previous years. It is reported that stream tin has been found in considerable quantities at nearly all the mines in this basin and that an investigation will be made relative to the possibility of saving that metal in connection with the recovery of the gold. It is believed, however, that the value of the presence of that metal lies in its indication that a ledge may exist, which, if located, might be worked at a profit. Sluicing in the basin opened May 10 on Tofty Gulch, where a prosperous season was reported. The overburden was groundsluiced off, and the auriferous gravel carried to the sluice boxes by a steam scraper. On Sullivan and Cache creeks new deposits of pay gravel are continually being located. Considerable difficulty has been caused by lack of sufficient sluicing water, and pumping has been resorted to on several claims in order to return the water to the head of the sluice after passing through. A few men were also mining on Quartz Creek during the summer.

On Thanksgiving and Pioneer creeks, where open-cut methods are used almost exclusively, a greater quantity of water is necessary for the successful operation of the mines than in those sections where deep-mining methods are practiced. The extreme drought, together with the losses due to carrying the water in ditches for several miles, caused the suspension of operations during a greater part of the season. On Eureka Creek claims "No. 7 above" to "No. 3 below" were worked by a Bagley bottomless scraper. The ground averaged about 12 feet deep and favorable results were reported, although some difficulty must have been experienced from the prevailing scarcity of water.

RAMPART DISTRICT.

The estimated value of the gold output from the Rampart district in 1910 was $43,000, about equally divided between winter and summer production. It was less than half the estimated output for 1909, and the decrease was undoubtedly due mainly to the fact that the richest pay streaks are about worked out, although a small decrease can be attributed to the closing down of the hydraulic plant on Hoosier Creek. It is estimated that 33 men were employed in mining on 18 claims during the winter of 1909–10 and 42 men on 15 claims in the summer of 1910. The chief development in the district during the past season was the introduction of a steam-shovel plant on Hunter Creek which was in operation near Discovery. Little Minook continues to be the chief producer and Hunter Creek comes second in output. Quail Creek takes third place, showing a larger production than for any year in the past, and if economical mining methods are introduced the creek promises to be one of the chief producers of the district. Some mining was also done on Little Minook Junior, Slate, Hoosier, and Big Minook creeks. It is reported that good prospects have been found on Hosiana Creek and in the fall of 1910 about 50 men were prospecting in the vicinity.

SALCHA-TENDERFOOT DISTRICT.

Tenderfoot Creek.—Renewed activity in mining operations on Tenderfoot Creek resulted from the location of good pay on bench claims opposite "Nos. 6 to 9 below." The appearance of the schist bedrock and the character of the wash indicate a higher channel which carries coarser gold than that found in the creek claims. Since the depth of the ground on this creek varies from 30 feet at "No. 1 below" to 180 feet at "No. 17 below" only drifting methods can be used for extracting the values. Small outfits were distributed rather irregularly along the creek from "No. 1 above" to "No. 14 below" and mining was being carried on during both the open and the closed season. The summer operations were greatly handicapped, however, through scarcity of water for sluicing. On an average between 25 and 30 men were employed on 10 claims throughout the year.

Banner Creek.—Very little mining was done on Banner Creek proper during the year, but considerable work was done on Democrat Creek, an upper tributary. The production of "Nos. 1 and 2 above" Democrat Creek represents a very large percentage of the total output of the creek. The depth of ground on these claims permits the use of open-cut methods. Two small outfits were also mining on Buckeye Creek.

Salcha River tributaries.—Actual mining operations in the upper Salcha basin were confined to No Grub and Caribou creeks. It is understood that very good returns resulted from the season's work in spite of the difficulties encountered in this section due to thawed ground and underground water. It is estimated that 20 men were employed in mining on about five claims. Seven men were occupied in prospecting on Twentymile and Butte creeks and about 10 men busied themselves in hunting pay gravel farther toward the head of Salcha River.

FORTYMILE DISTRICT.

GENERAL CONDITIONS.

Although no water-supply investigations have been carried on in the Fortymile district prior to 1910, it is believed that the stream flow for the summer reached an extremely low stage, and the decrease in the value of the gold output from $225,000 in 1909 to $200,000 in 1910 can be attributed almost entirely to the inadequate supply of water for mining. No new developments were introduced during 1910, and the mining methods used were practically the same as have been in vogue for several years. The possibilities of economically recovering the gold by means of dredges have been seriously studied, and since 1907 five different dredges have been installed on Fortymile River and its tributaries. The experience derived from their operations should be of incomparable value to those contemplating the introduction of such methods elsewhere in the Yukon-Tanana region, where conditions in a general way are very similar. Perhaps as a whole they have not proved to be a financial success, and sufficient information is not available to determine the reasons for the failures which have occurred. It is probable, however, that failures are in a large measure directly chargeable to lack of thorough prospecting on the part of the promoters to determine the gold content of the ground. The value of thorough prospecting by those vitally interested can not be too much emphasized, for it shows not only the value of the gold that can be obtained from the unit quantities of gravel to be mined but also the suitability of the ground for dredging. No hydraulic development of any magnitude has been instituted in this district, but it seems reasonable to predict that eventually such means will be employed to a considerable extent. It is hoped that the investigations relative to the water supply which are being carried on in the district will prove of value in considering the feasibility of the several projects and that failures due to a lack of sufficient water may be largely eliminated by such information. A summary of the stream-flow data gathered in this district during 1910 can be found on pages 202–209.

MINING OPERATIONS.

Walker Fork.—The dredge on Walker Fork near Poker Creek had an exceptionally prosperous season. Some trouble was encountered during the earlier part of the summer in frozen ground and steam points were used to thaw ahead of the dredge, but it is understood that after the middle of July no further difficulties were experienced in that respect. A gang of men was kept at work stripping the ground that will be worked another season, and it is expected that by so doing the ground will be thawed ready for the dredge. The dredge is steam driven and the fuel supply, which is wood, has become so depleted that it is now necessary to haul it several miles, making an excessive cost, which on some ground might prove so dear that operations would be conducted at a loss.

Considerable work was in progress on both Davis and Poker creeks and about six or seven men were working on each creek. The gold was recovered by groundsluicing and shoveling into sluice boxes. No winter work has been done on either creek, aside from propecting.

Two men were engaged in prospecting Walker Fork below Cherry Creek in order to determine the feasibility of dredging in that vicinity, but the results are not known. Some prospecting was also done on Cherry Creek.

Canyon and Squaw creeks.—On Canyon Creek about 3 miles below Squaw Gulch a steam scraper of one-half yard capacity, drawn by a 45-horsepower boiler connected with a double-drum hoist, was in operation during the later part of the season. It is claimed that 150 cubic yards could be handled per day of 10 hours. The ground averages about 7 feet in depth and is practically all gravel. The bedrock is slate and mica schist, and about 2 feet is moved in order to recover all the gold. A plowlike arrangement, operated by the same line of cables that is employed in hoisting the dirt to the sluice, is used to break up the bedrock so that it can be moved by the scraper. The plowing was done in the evening, and two or three men were able in a few hours to loosen all the bedrock that could be handled during the following day. Eight men were employed in connection with the plant. During the early part of the season a scraping plant of smaller capacity was in operation just below the mouth of Squaw Gulch.

On Squaw Gulch three or four outfits of one to three men each were mining by open-cut methods at times during the summer.

Wade Creek.—The production from Wade Creek in the summer of 1910 was greatly curtailed by a lack of water during most of the season. In the winter 18 claims were worked by 41 men, and during the summer 24 men were employed on 10 claims when the water supply was adequate. All the summer work was done by open-cut methods and was confined mostly to bench claims.

Chicken Creek and tributaries.—Although the lack of water for sluicing necessitated the suspension of operations on Chicken Creek during the greater part of the season, two outfits employing 6 men were drifting and 11 men were doing open-cut work on four claims for short periods throughout the season. Only one claim was worked during the winter and on this 10 men were employed.

The mining on Stonehouse Creek was about equally divided between winter and summer work. Ten different claims were worked by three men each. On Myers Fork seven men were mining on claims Nos. 1, 2, and 5 at different times of the year. During the summer open-cut methods were used.

On Lost Chicken Creek five or six men were engaged in mining for most of the year.

Ingle Creek.—Reports from Ingle Creek indicate that considerable work was in progress, and about five men were engaged in mining during most of the year. Four claims were worked by drifting in winter and open-cut methods in the summer. Some work was done also on Lilliwig Gulch, which is a small tributary of Ingle Creek.

Franklin and Napoleon creeks.—Franklin Creek, the oldest gold-producing tributary of Fortymile River, is still being mined each summer by groundsluicing and shoveling into boxes. Very little was accomplished during July and August because of a lack of water, although six men were on the creek in readiness for work when the supply would permit.

Work on Napoleon Creek was also brought to a standstill by a lack of water during the greater part of the season, although two men recovered some gold in the short time that a sluice head was available.

Other streams.—Pay gravel has been found on Fortyfive Pup, a tributary of Buckskin Creek, at claim No. 13, and considerable ground was worked by two men under the prevailing difficulties attending mining operations in a small drainage basin during a dry season.

Hutchinson Creek and its two tributaries, Confederate and Montana creeks, are known to carry pay gravel, but the extremely dry weather of the season of 1910 practically eliminated all operations involving the recovery of gold, although considerable dead work was accomplished. Two automatic dams were built. Five men were in the basin during the summer.

Fortymile bars.—Gravels with a high gold content are said to occur on a bench of Fortymile River near the mouth of Twin Creek, which is a tributary from the north about one-half mile below Steele Creek. During the summer of 1909 a ditch was built which diverts water from Twin Creek a short distance below the forks. It has a length of 9,000 feet, a bottom width of 2 feet, and a grade of 6.9 feet per mile. A pressure of 150 feet is obtained, and it is planned to hydraulic the bench gravels. No mining was accomplished during the season of 1910, owing to a lack of water.

A small dredge designed more especially for prospecting was in operation for a portion of the season on a bar of Fortymile River near the boundary, but the details of the operation are not known.

On Atwater Bar, at the mouth of Atwater Creek, four men were mining during a considerable portion of the year, and it is reported that satisfactory results were obtained.

Owing to the low stage of the river during the summer the conditions were extremely favorable for the few men who were washing the gravel by the use of rockers.

Troublesome Point, opposite the mouth of Franklin Creek, is still the scene of mining, but very little was accomplished during the summer, owing to the fact that the water supply is derived from a small gulch back of the mine which could furnish a sluice head of water only during a period of extended rains.

SEVENTYMILE DISTRICT.

It is estimated that the combined gold output from the Seventymile and Eagle districts for the year 1910 was approximately $10,000. In the Seventymile district about 20 men were engaged in mining, but during the winter very little was done aside from prospecting. Early in the spring considerable local excitement was caused by the finding of some coarse gold on Rock Creek near its head. The depth of the ground is about 50 feet, composed almost entirely of muck. As the gold is concentrated on bedrock high values to the pan were obtained, but the aggregate value of the gold content per square foot of bedrock was too small for the ground to be worked at a profit. Several large boilers were shipped to the creek and prospecting was continued throughout the summer, but no more encouraging prospects were found.

During the summer of 1909 a ditch which diverts water from Sonickson Creek was constructed, but it was not put into use until last season, when the water under pressure was used to remove the overburden from the river bar above the falls. The ditch is 6,000 feet long and has a bottom width of 3 feet and a grade of 4.6 feet per mile. A pressure of 150 feet is available. A Ruble elevator was constructed but did not prove adapted to the conditions. The overburden was therefore hydraulicked into the river and the pay gravel shoveled into sluice boxes. On Curtis Bar a small winter dump was taken out and some work was done during the summer. Two men were also mining on a bar just above the falls, on the north side of the river, for a short time during the later part of the season. On Crooked Creek claims "Nos. 2 and 3 above" were worked by 10 men most of the summer. The overburden was removed by water under a 40-foot pressure. The water was carried in a ditch 2,200 feet long. A small ditch was also constructed for use in working Discovery and adjoining claims.

Mining on Barney Creek was confined to the operation of the small hydraulic plant which has been in use for several years, and two men were employed in the performance of the work.

During the summer about a mile of ditch was built, which diverts water from Washington Creek [1] near its head and carries it over the divide for use on Pleasant Creek, which is the first tributary of Seventymile River from the north above Barney Creek. It is said

[1] Washington Creek heads in the divide north of Seventymile River near Barney Creek and is tributary to Yukon River about 15 miles above Charley River.

that the benches on the right bank of Pleasant Creek carry gravels containing sufficient gold to mine at a profit if an adequate water supply could be obtained, but it is very doubtful if the quantity available in Washington Creek, at the elevation necessary to carry it over the divide by gravity, will be found to be of much assistance.

One man was working on Nugget Creek and one on Broken Neck Creek during the summer when the water supply would permit.

Values are reported to have been found on Alder Creek. The auriferous gravels so far located lie in or near the creek channel, where the depth of the ground averages about 4 feet. Nuggets valued at $19, $8.50, and $7 and several $1 and $2 specimens were found. Plans were made to do considerable prospecting on Alder Creek during the winter of 1910–11.

Two men were engaged in mining on Flume Creek near the mouth throughout the season. A reservoir and an automatic dam were built on the left-limit bench of claim No. 1. The water was carried to the reservoir in a ditch which was constructed several years ago.

EAGLE DISTRICT.

In the Eagle district mining operations were confined to American Creek and its tributary, Discovery Fork. On American Creek two automatic dams were installed—one on claim "No. 8 above" and one on claim "No. 2 above." At the upper workings an average of four or five men were employed the entire season, and after the completion of the dam considerable ground was worked. At claim "No. 2 above" the work was confined almost entirely to the construction of the dam and waste ditch and the opening of ground in preparation for another season. Some mining was also done on two other claims during a part of the season. Two outfits of two men each were working by open-cut methods on Discovery Fork.

MINOR YUKON RIVER DISTRICTS.

On Woodchopper Creek during the winter of 1909–10 three claims were worked, on which 15 men were employed, and during the summer of 1910 six men were engaged in mining on two claims. The value of the gold output for the year is estimated at $19,000.

Fourth of July Creek gave a production of about $6,000. Four claims were worked in the winter by 11 men and in the summer 12 men were mining on five claims. Both drifting and open-cut methods were used. One automatic dam was in operation.

On Coal Creek an average of about 20 men were engaged in mining during the year. A hydraulic plant was operated under a pressure of 160 feet. The water was diverted from Boulder Creek, which is a small tributary of Coal Creek. It is reported that values have been located on Sams Creek and that about 16 men were either mining or prospecting along the stream.

Two men were mining by open-cut methods on Surprise Creek, which is a tributary of Washington Creek.

WATER SUPPLY OF THE YUKON-TANANA REGION, 1910.

By C. E. Ellsworth and G. L. Parker.

INTRODUCTION.

This report has been prepared to furnish for immediate use the essential results of the water-supply investigations in the Yukon-Tanana region during the season of 1910.

The work was begun in this region in 1907 and has been continued each succeeding year. The data collected in 1907 and 1908[1] and their analyses have been published in detail. Those of 1909[2] were presented in the progress report for that year in a form similar to the arrangement used in this paper.

The writers arrived at Fairbanks March 31, and until the later part of May the time was devoted to a study of winter run-off and mining conditions and to general preparations for the summer work. In the early part of June, after having commenced the investigations in the Circle district, C. E. Ellsworth proceeded to Eagle and began a study of the water supply in the Fortymile, Eagle, and Seventymile districts, where he continued work until the later part of September. G. L. Parker continued the work in the Fairbanks, Circle, and Salchaket districts during the remainder of the season and was assisted by T J. Shaw during July and August in the Little Chena River drainage basin.

On account of the large area to be covered, the slow means of transportation, and the needs and possibilities of the several districts, it was decided that the data would be of more value if the investigations in the Rampart and Hot Springs districts were discontinued and the remaining time devoted to a more thorough study of the conditions in the Fairbanks and Circle districts.

The writers desire to express their appreciation of the courtesies extended and aid given to the work by many residents of the region. Special acknowledgments for supplying gage readings are due to

[1] Covert, C. C., and Ellsworth, C. E., Water-supply investigations in the Yukon-Tanana region, Alaska, 1907-8: Water-Supply Paper U. S. Geol. Survey No. 228, 1909.

[2] Ellsworth, C. E., Water supply of the Yukon-Tanana region, 1909: Bull. U S. Geol. Survey No. 442, 1910, pp. 251-283.

Messrs. J. P. Carroll, Albert Carruthers, M. Danielson, J. T. Dickinson, August Fritch, Arthur Froelich, Mrs. A. Gustavason, Messrs. R. C. Hall, William Hugel, Alfred Johnson, J. F. Kelley, J. W. McCluskey, Jack McLin, Dan McPherson, Charles Martin, —— Michaels, Frank Miller, Frank Montgomery, Oscar Morrill, W. F. Munson, James Murphy, T. E. Phillips, C. A. Pihl, —— Powers, John Roberts, E. A. Robertson, Henry Siemer, A. F. Stowe, John B. Tait, Mrs. F. Warren, and Messrs. Robert Warren and John Williams.

MISCELLANEOUS MEASUREMENTS.

A number of miscellaneous measurements were made during the season of 1910 at points where it was impracticable to attempt to procure daily records.

A comparison of the run-off per square mile at the points where daily records were obtained shows a general trend of similarity, but the daily variations and in some cases the monthly departures from the general average are so great that extreme care should be used in making estimates from these measurements.

The season as a whole was characterized by considerable fluctuation in the stage of the streams, but most of the miscellaneous measurements were made during July and August, when the run-off was very low and the flow fairly uniform.

EXPLANATION OF DATA AND METHODS.

The methods of carrying on the work and collecting the data were essentially the same as those previously used for similar work[1] but were adapted to the special conditions found in Alaska.

In the consideration of industrial or mining enterprises which use the water of streams, it is necessary to know the total amount of water flowing in the stream, the daily distribution of the flow, and facts in regard to the conditions affecting the flow. Several terms are used—such as second-foot, miner's inch, and gallons per minute—to describe the quantity of water flowing in a stream, the one selected depending on the use to be made of the data.

"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 quantity of water flowing per second in a stream 1 foot wide and 1 foot deep at the rate of 1 foot per second. It should be noted that it is a *rate* of flow, and to obtain the actual quantity of water it is necessary to multiply it 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,

[1] See Water-Supply Papers U. S. Geol. Survey Nos. 94, 95, and 201.

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 and size of the orifice used in different localities vary, thus making it 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 approved 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.

The determination of the quantity of water flowing past a certain section of a stream at a given time is termed a "discharge measurement." The quantity is the product of two factors—the mean velocity and the area of the cross section. The mean velocity is a function of surface slope, wetted perimeter, roughness of bed, and the channel conditions at, above, and below the gaging station. The area depends on the contour of the bed and the fluctuations of the surface. The two principal ways of measuring the velocity of a stream are by floats and current meters.

All measurements by the engineers of the Survey were made with the current meter, 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 multiplied by 0.85 to 0.90 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.

In measuring velocity by a float, observation is made of the time taken by the float to pass over the "run"—a selected stretch of river or creek from 50 to 200 feet long. In each discharge measurement a large number of velocity determinations are made at different points across the stream, and from these observations the mean velocity for the whole section is determined.

The area used in float measurements is the mean of the areas at the two ends of the run and at several intermediate sections.

PRECIPITATION.

Precipitation records for 1910 show that the rainfall at Fairbanks was about 15 per cent below the average from 1906 to 1910; at Fort Gibbon it was about 6 per cent below the average from 1904 to 1910; and at Fort Egbert it was about 2 per cent above the average from 1903 to 1910. At Rampart a precipitation of only 5.32 inches was recorded, which is lower than that of any other year since the beginning of records at that station in 1905 and only about one-half the average for the last six years.

A comparison of the records of 1910 with those of 1909 shows that at Fairbanks and Fort Gibbon there was a small decrease in precipitation during the last year, whereas at Fort Egbert there was a considerable increase. At Rampart the decrease was nearly 50 per cent from the precipitation of 1909.

Although there is a wide difference from month to month and from year to year in the rainfall at the several stations in the Yukon-Tanana region, the mean yearly precipitation at each station for the period covered by the records is uniformly close to the average of the means of all the stations. In other words, the records show no uniform difference in precipitation throughout this area.

The following table gives the monthly precipitation at all points in the Yukon-Tanana region where records have been kept subsequent to 1903. Such scattered records as were kept previous to 1903 have been compiled by Abbe.[1]

Monthly precipitation, in inches, at stations in Yukon-Tanana region, 1903–1910.

[Rainfall or melted snow is given in the first line; snowfall in the second line.]

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	......	......	......
Cleary	1907	......	......	......	......	......	.84	2.55	2.88	3.82	......	......	......	......
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	......

[1] Abbe, Cleveland, jr., Prof. Paper U. S. Geol. Survey No. 45, 1906, pp. 189–200.

Monthly precipitation, in inches, at stations in Yukon-Tanana region, 1903-1910—Con.

Station.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Fairbanks	1906	1.75	0.37	0.33	0.10	0.36	1.05	2.82	1.50	0.25	0.30	0.65	1.15	10.63
		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	1.57	.47	.51	.65	7.96
		4.2	2.1	11.0	.8	......	......	......	......	......	......	......	8.1	26.2
Do	1909	.90	.08	.05	.66	.38	1.64	1.90	1.73	.39	.80	.52	.80	9.85
Do	1910	.70	.14	.02	.36	.39	2.16	.46	1.69	1.91	.66	.50	.76	9.75
Faith Creek	1907	......	......	......	......	......	......	1.87	3.00	2.97	......	......	......	......
Fort Egbert	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	.21	0	.25	.40	1.89	1.48	1.98	1.45	1.12	.40	.31	10.94
		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	.81	.30	......	......
		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
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	......	......	......	......	a.50	.99	.27	......
		6.0	2.0	3.0	......	......	......	......	......	......	a5.0	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	......
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	b2.16	......	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	......	......	......	......	......	......	......	......
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	......	......	......	......
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	1.09	......
		......	......	......	......	......	......	......	......	......	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
Summit road house	1907	......	......	......	......	......	......	2.71	3.27	c3.33	......	......	......	......
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 Oct. 7 to 31. b July 16 to 31. c Sept. 1 to 22.

Precipitation records for June to September, inclusive, at several points in the Yukon-Tanana region may be summarized as follows:

Summary of summer precipitation in Yukon-Tanana region.

Station.	Maximum.		Minimum.		Mean (inches).	Duration of records.	Precipitation for 1910 (inches).
	Inches.	Year.	Inches.	Year.			
Circle	7.64	1907	4.36	1908	6.38	1907–1909	....
Fairbanks	8.37	1907	3.97	1908	5.97	1906–1910	6.22
Fort Egbert	9.57	1905	5.95	1909	7.09	1903, 1905–1910	8.94
Fort Gibbon	10.01	1905	4.98	1908	6.59	1903–1905, 1907–1910	5.36
Kechumstuk	7.88	1906	4.64	1904	6.41	1904–1908	....
Rampart	9.83	1907	2.74	1910	5.66	1905–1910	2.74
Mean	....	....	....	....	6.35	....	5.82

The uniformity of precipitation throughout the Yukon-Tanana region, as already noted, for yearly periods is also noticeable, though to a less extent, for the summer months. In the above table Fort Egbert has the highest average precipitation from June to September and is 12 per cent above the mean for all of the stations; Rampart has the lowest average precipitation and is 11 per cent below the mean for all the stations.

The table also shows that a total precipitation as high as 10.01 inches and as low as 2.74 inches has occurred during the mining season and it leads to the conclusion that the general scarcity of water for mining uses during 1910 throughout the Yukon-Tanana region (with the exception of the Rampart district) was not due to an unusually small amount of rainfall in the aggregate but rather to its distribution with respect to time and area. A study of the run-off from adjoining drainage basins during the last four years indicates that a wide difference in stream flow may be expected even though geologic and topographic conditions are apparently very similar. In order to arrive at any definite conclusions regarding areal distribution of the rainfall by a comparison of simultaneous records, it would be necessary to have a greater number of rain gages more systematically located. Such comparisons as can be made with the existing data, however, confirm the general opinion that the precipitation is distributed rather unevenly. This condition is often noticeable in the summer, when local showers visit one portion of the drainage basin and do not reach another portion.

HYDRAULIC DEVELOPMENT.

Because of many unfavorable factors, mining by the use of water under pressure has so far played a very small part in the recovery of placer gold in the Yukon-Tanana region. The relatively high elevations at which most of the mines are located and the uniformity in elevation of the sources of the streams make it extremely difficult to obtain a sufficient supply of water at an elevation that will give a working head at the mines. The low stream gradients which prevail in the interior make necessary some means of elevating the gravels, which in turn involves the use of larger quantities of water under a higher head than would be necessary if the slope of the bedrock underlying the gravels was equal to or greater than that required for the sluice boxes.

Notwithstanding the many difficulties which must be overcome in order to successfully utilize such means of extracting the gold, several small plants have already been installed and larger ones are under consideration.

The developments in the several districts during the season of 1910 are described in another section of this volume. (See pp. 153–172.)

WATER POWER.

The following tables have been prepared in order to summarize briefly the records of stream flow that have been gathered on streams in the Yukon-Tanana region which offer any possibility for water-power development.

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 following tables give the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge and show 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 table for Chatanika River, Little Chena River, and Washington Creek for 1907–1910.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Days of deficient discharge.										
		Chatanika River below Faith Creek.			Chatanika River below Poker Creek.				Little Chena River and tributaries.[a]			Washington Creek below Aggie Creek.
		June 21 to Sept. 30, 1907.	July 13 to Sept. 30, 1908.	May 25 to Sept. 25, 1910.	June 20 to Oct. 14, 1907.	May 16 to Oct. 21, 1908.	May 9 to Oct. 5, 1909.	May 17 to Oct. 29, 1910.	July 22 to Sept. 10, 1907.	May 1 to Aug. 27, 1908.	July 1 to Aug. 31, 1910.	May 5 to Sept. 4, 1908.
22	2	......	......	......	......	......	......	......	......	......	......	0
28	2.5	......	......	......	......	......	......	......	......	......	......	3
33	3	0	......	......	......	......	......	......	......	......	0	30
44	4	13	......	0	......	......	......	......	......	......	18	51
55	5	16	......	14	......	......	......	......	......	0	35	61
66	6	29	......	29	......	......	......	......	0	26	40	66
77	7	39	0	34	......	......	......	......	3	31	42	68
88	8	47	2	37	......	......	0	0	7	36	44	72
99	9	52	4	39	......	......	2	2	13	44	45	75
110	10	56	19	45	......	......	5	3	15	48	46	76
132	12	69	35	47	......	......	17	22	23	55	50	......
154	14	73	57	54	0	......	26	40	35	58	......	......
176	16	77	58	64	5	0	27	49	42	60	......	......
198	18	78	65	69	17	5	39	55	45	63	......	......
220	20	82	66	79	27	27	46	60	48	67	......	......

[a] The discharge of Little Chena River and tributaries includes the discharge of Little Chena River above Sorrels Creek, Elliott Creek, Sorrels Creek at mouth, and Fish Creek above Fairbanks Creek.

Estimated discharge and horsepower table for Fortymile and Seventymile rivers for 1910.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Days of deficient discharge.		Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Days of deficient discharge.	
		Fortymile River at "kink," July 9 to Sept. 23, 1910.	Seventymile River at falls, June 16 to Sept. 30, 1910.			Fortymile River at "kink," July 9 to Sept. 23, 1910.	Seventymile River at falls, June 16 to Sept. 30, 1910.
198	18	....	0	275	25	2	18
209	19	....	3	286	26	3	22
220	20	....	4	297	27	7	26
231	21	....	10	308	28	13	31
242	22	....	10	330	30	15	33
253	23	0	11	385	35	20	49
264	24	2	16	440	40	30	57

WINTER RUN-OFF.

Measurements were made during April, 1910, to determine the winter flow of several streams in the Yukon-Tanana region. They were made by chopping holes through ice varying in thickness from 2 to 3½ feet, sounding, and measuring the velocity at each section by a current meter. The results are given in the following table:

Winter discharge measurements in Yukon-Tanana region in 1910.

Date.	Stream.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-feet.*	*Sec.-feet.*
Apr. 6....	Tanana River 3 miles below Chena	a 24,000	4,450	0.185
Apr. 8....	Chatanika River below Poker Creek	456	1.91	.0042
Apr. 17...	Salcha River at mouth	2,170	64.5	.0297

a This area was obtained from the topographic map of Alaska, scale 1:2,500,000, and is therefore only approximate.

It is reasonable to suppose that the discharge of streams in this section during April represents the minimum flow for the year if it is assumed that the supply is furnished by springs in the stream bed and underground drainage, which is no doubt the case.

The results obtained indicate that no general relation between the winter and summer flow can be deduced. Such a relation could hardly be expected, as the surface drainage is the principal factor regulating the summer flow, and this element is entirely lacking in the winter season, when all of the surface water is stored in the form of ice and snow.

It is interesting to note that the discharge per square mile of the streams measured is greater for large areas than for small, a relation which is ordinarily reversed during the summer months. There are not enough data at hand, however, to warrant the supposition that this relation exists generally.

FAIRBANKS DISTRICT.

DESCRIPTION.

The area known as the Fairbanks district extends about 60 miles to the north of Fairbanks and is from 40 to 50 miles wide. The greater part of the region lies in the lower Tanana basin, but a portion to the northwest drains directly to the Yukon. Generally speaking, the district embraces three divisions—a low, broad alluvial plain, a moderately high dissected plateau, and a mountain mass.

The low, broad plain forms the bottom lands of the lower Tanana Valley, which in this section is divided into several parts by the Tanana and its sloughlike channels. The main slough starts near the mouth of Salcha River, about 30 miles above Fairbanks, and diverts a portion of the Tanana waters. Its course is northward along the foothills of the plateau, and it receives Chena River about 9 miles above Fairbanks. The plain is swampy and is well covered with timber along the banks of the streams. In the vicinity of Fairbanks it has a general elevation of about 500 feet above sea level.

The plateau is drained by streams tributary to Tanana River which flow through rather broad, unsymmetrical valleys, chiefly extending in a northeast-southwest direction. Their bottom lands range in elevation from 500 to over 2,000 feet above sea level, and the dividing ridges are in general 1,000 to 3,000 feet above the stream beds. That portion of the plateau discussed in this report is drained principally by Little Chena and Chatanika rivers. The upper region of these drainage basins is crosscut by a zigzag range, which separates the Yukon from the Tanana drainage.

The mountain mass north of this plateau forms what might be termed the apex of the divide between the Tanana and the Yukon drainage basins; its highest points reach altitudes 4,000 to 5,000 feet above sea level and its corrugated slopes are drained principally by tributaries to Yukon River.

All drainage areas tributary to the Tanana are similar in character. The streams have little slope except near their source and flow over wide gravelly beds in shifting and tortuous courses, keeping to one side of the valley. Most of the channels have rather steep banks that form approaches to broad, level bottom lands which extend 1,000 to 4,000 feet or more before they meet the abrupt slopes of the dividing ridges. The drainage basins are 4 to 15 miles wide and are cut up by small tributary streams that flow through deep and narrow ravines.

A large portion of the area is covered with a thick turf, known as tundra, which is wet, spongy, and mossy and ranges in thickness from 6 inches to 2 feet. In some localities this is meadow-like, producing a rank growth of grass and a variety of beautiful wild flowers. Ground ice is found beneath this tundra in many places, particularly on the northern slopes, where the scanty soil supports little timber or other vegetation. The soil of the southern slopes is, for the most part, clay, underlain by a mica schist which affords suitable ground for ditch construction. When stripped of its mossy covering and exposed to the sun it thaws rapidly, so that the plow and scraper can be used to advantage.

Above altitudes of 2,000 to 2,200 feet practically the only vegetation is a scrubby, bushy growth which attains a height of 2 to 4 feet. In general the country below this altitude is timbered by spruce and birch, with scattered patches of tamarack and willow along the banks of the smaller streams. The timber increases in density and size toward the river bottoms, where the prevailing growth is spruce, much of which attains a diameter of 18 to 24 inches.

The Fairbanks mining district lies between Little Chena and Chatanika rivers. It embraces an area of about 500 square miles and extends 30 miles north of Fairbanks, which is situated on Chena Slough nearly 12 miles above its confluence with the Tanana. Most of the producing creeks rise in a high rocky ridge, of which Pedro Dome, with an elevation of about 2,500 feet, is the center. At least half of the mines are located at an elevation of over 800 feet, and 25 per cent are over 1,000 feet above sea level.

GAGING STATIONS AND MEASURING POINTS.

The following list gives the locations at which gaging stations were maintained or discharge measurements made in 1910, in the Fairbanks district:

Gaging stations and measuring points in Fairbanks district, 1910.

- Tanana River drainage basin:
  - Chena River drainage basin:
    - Chena River above Little Chena River.
    - Little Chena River above Sorrels Creek.
    - Little Chena River below Fish Creek.
    - Elliott Creek above mouth.
    - Elliott Creek at mouth.
    - Sorrels Creek at mouth.
    - Fish Creek below Solo Creek.
    - Fish Creek at mouth.
    - Solo Creek at mouth.
    - Bear Creek at mouth.
    - Fairbanks Creek at mouth.
    - Miller Creek above Heim Creek.
    - Miller Creek at mouth.
    - Heim Creek at mouth.
  - Chatanika River drainage basin:
    - Chatanika River below Faith Creek.
    - Chatanika River below Poker Creek.
    - McManus Creek at mouth.
    - Smith Creek above Pool Creek.
    - Pool Creek at mouth.
    - Charity Creek above Homestake Creek.
    - Homestake Creek at mouth.
    - Deep Creek at mouth.
    - Orphan Boy Creek at mouth.
    - First tributary below Sourdough Creek from right side at mouth.
    - Cripple Creek at mouth.
    - Cassiar Creek at mouth.
    - Flat Creek below Third Pup.
    - Flat Creek below First Pup.
    - Juniper Creek at mouth.
    - Kokomo Creek above Rusty Gold Creek.
    - Poker Creek at mouth.
    - Poker Creek ditch near outlet.
  - Goldstream Creek drainage basin:
    - Gilmore Creek near mouth.
    - Pedro Creek near mouth.
    - Fox Creek near mouth.

CHENA RIVER DRAINAGE BASIN.

Chena River drains the area lying between Chatanika River on the north, Birch Creek on the east, and Salcha River on the south. 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. The principal tributaries are the West Fork and Little Chena River from the north and the South Fork from the south.

Little Chena River and its tributaries Sorrels and Fish creeks drain the southern slope of the divide between Chatanika and Chena rivers from the headwaters of Smith and Flat creeks to Pedro Dome, a distance of about 25 miles. The drainage basin is irregular in shape and 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 Elliott and Fish creeks.

Above Fish Creek the Little Chena flows through a rather broad, unsymmetrical valley, but below that stream it takes the center of a deep, rather narrow channel for about 10 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 6 or 8 miles above the confluence of Chena Slough.

Monthly discharge of streams in Little Chena River drainage basin for 1907–1910.

Little Chena River above Sorrels Creek.

[Drainage area, 79 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Mean per square mile.	
1907.					
July 22-31	80	42	49.3	0.625	0.23
August	157	53	85.4	1.08	1.24
Sept. 1-10	95	66	86.2	1.09	.40
The period, 51 days	157	42	78.4	.993	1.87
1908.					
May 20-31	405	210	296	3.75	1.67
June	223	65	142	1.80	2.01
July	65	33	43.2	.547	.63
Aug. 1-26	79	28	41.1	.520	.49
The period, 99 days	405	28	103	1.30	4.80
1910.					
July	166	22	37.0	.468	.54
August	350	22	74.5	.943	1.09
The period, 62 days	350	22	55.8	.706	1.63

Monthly discharge of streams in Little Chena River drainage basin for 1907–1910—Con.

Little Chena River below Fish Creek.

[Drainage area, 228 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Mean per square mile.	
1908.					
May	1,670	265	832	3.65	4.21
June	651	161	284	1.25	1.40
July	161	64	94.9	.416	.48
Aug. 1–27	122	59	79.2	.347	.35
The period, 119 days	1,670	59	332	1.46	6.44
1910.					
July	232	38	67.3	.295	.34
August	460	36	109	.478	.55
The period, 62 days	460	36	88.2	.386	.89

Elliott Creek above mouth.

[Drainage area, 13.8 square miles.]

Month.	Maximum.	Minimum.	Mean.	Mean per square mile.	Run-off
1907.					
July 22–31	9.0	2.5	5.94	0.430	0.16
August	23	5.8	11.0	.797	.92
Sept. 1–10	12.3	9.0	10.1	.724	.27
The period, 51 days	23	2.5	9.82	.711	1.35
1908.					
May 20–31	216	11	67.8	4.91	2.19
June	32	8.6	14.8	1.07	1.19
July	7.5	4.5	5.22	.378	.44
Aug. 1–26	4.6	4.4	4.48	.324	.31
The period, 99 days	216	4.4	15.5	1.12	4.13
1910.					
July	10.6	2.3	3.50	.254	.29
August	15.1	2.3	5.60	.405	.47
The period, 62 days	15.1	2.3	4.55	.330	.76

Sorrels Creek near mouth.

[Drainage area, 21 square miles.]

Month.	Maximum.	Minimum.	Mean.	Mean per square mile.	Run-off
1907.					
July 22–31	14.7	6.0	10.5	0.500	0.19
August	32.1	10.3	18.2	.867	1.00
Sept. 1–10	19	14.7	16.0	.762	.28
The period, 51 days	32.1	6.0	16.3	.777	1.47
1908.					
May 20–31	131	36	73.0	3.48	1.55
June	72	27	42.8	2.04	2.28
July	38	11	19.9	.948	1.09
Aug. 1–26	18	10	12.5	.595	.58
The period, 99 days	131	10	31.3	1.49	5.50
1910.					
July	46	3.6	7.53	.359	.41
August	36	3.6	12.2	.581	.67
The period, 62 days	46	3.6	9.86	.470	1.08

Daily discharge, in second-feet, of Chena and Little Chena rivers and Elliott Creek for 1910.[a]

Day.	Chena River above Little Chena River (drainage area, 1,440 square miles).						Little Chena River above Elliott Creek (drainage area, 79 square miles).		Little Chena River below Fish Creek (drainage area, 228 square miles).		Elliott Creek above mouth (drainage area, 13.8 square miles).	
	May.	June.	July.	Aug.	Sept.	Oct.	July.	Aug.	July.	Aug.	July.	Aug.
1	....	1,550	1,130	1,190	1,760	1,390	27	47	75	80	3.0	3.9
2	....	1,870	1,200	1,470	1,620	1,350	27	37	70	67	3.0	3.6
3	....	1,720	1,150	1,390	1,540	1,310	27	34	65	58	3.0	3.4
4	....	1,400	971	1,180	1,660	1,130	27	32	60	56	2.9	3.1
5	....	1,370	860	1,000	1,880	1,150	27	31	58	51	2.9	3.0
6	....	1,330	811	925	2,340	1,120	27	28	56	48	2.8	2.8
7	....	1,800	988	847	3,000	1,000	26	27	53	45	2.6	2.9
8	....	1,550	998	784	2,800	874	25	26	50	44	2.6	2.6
9	....	1,400	886	747	2,350	767	25	25	47	44	2.6	2.6
10	....	1,440	798	687	2,090	759	25	25	48	42	2.8	2.6
11	....	7,190	751	648	1,880	731	24	24	48	40	2.6	2.4
12	....	8,850	711	641	1,760	699	24	24	48	39	3.0	2.3
13	....	7,400	655	578	1,660	780	25	23	48	38	2.8	2.3
14	....	4,860	655	578	1,630	870	24	22	47	36	2.6	2.3
15	....	3,500	599	578	1,680	816	23	22	44	37	2.6	2.3
16	....	2,650	602	578	2,580	727	22	24	40	39	2.5	2.6
17	4,550	2,440	606	578	3,260	679	22	27	38	50	2.4	3.8
18	3,880	2,060	582	613	3,260	719	22	350	38	194	2.3	14.6
19	3,290	1,700	544	1,590	3,280	727	23	272	41	460	2.5	14.8
20	3,180	1,420	538	4,700	2,910	691	22	194	40	256	2.4	15.1
21	3,480	1,320	518	4,350	2,360	634	23	126	44	194	3.3	10.8
22	3,690	1,240	495	3,670	2,050	571	33	98	64	162	4.2	8.4
23	2,980	1,210	495	2,640	1,960	550	89	80	111	142	5.5	6.9
24	2,640	1,180	557	2,330	1,900	550	166	82	232	142	10.6	8.9
25	3,210	1,150	1,010	2,040	1,870	550	85	100	145	172	6.5	8.4
26	3,630	1,090	1,390	2,180	1,750	550	55	118	108	176	5.2	7.8
27	2,430	1,020	1,370	2,540	1,690	550	41	102	85	162	4.2	7.1
28	1,660	1,040	1,200	2,290	1,620	550	37	91	70	145	3.6	6.5
29	1,420	982	1,020	2,360	1,560	....	32	78	59	132	3.4	5.7
30	1,370	915	925	2,100	1,450	....	37	72	64	122	3.6	5.2
31	1,330	....	844	1,930	....	....	55	70	91	110	4.4	5.0
Mean	2,850	2,290	834	1,600	2,100	814	37.0	74.5	67.3	109	3.50	5.60
Mean per square mile	1.98	1.59	.579	1.11	1.46	.565	.468	.943	.295	.478	.254	.405
Run-off (depth in inches on drainage area)	1.10	1.77	.67	1.28	1.63	.59	.54	1.09	.34	.55	.29	.47

a All these discharges are based on well-defined rating curves.

Daily discharge, in second-feet, of Sorrels, Fish, and Miller creeks for 1910.

Day.	Sorrels Creek at mouth (drainage area, 21 square miles).[a]		Fish Creek below Solo Creek (drainage area, 21.5 square miles).[b]					Fish Creek at mouth (drainage area, 90.2 square miles).[a]		Miller Creek at mouth (drainage area, 16.7 square miles).[c]	
	July.	Aug.	June.	July.	Aug.	Sept.	Oct.	July.	Aug.	July.	Aug.
1	5.2	7.9	......	7.1	7.0	13.3	9.2	24	18.0	3.5	3.3
2	5.1	6.8	......	7.0	6.4	15.7	9.2	22	16.6	3.3	3.0
3	5.0	6.2	......	7.0	5.9	13.3	......	19.8	16.1	3.1	2.5
4	4.9	5.5	......	6.9	5.5	28	......	19.2	16.1	2.9	2.5
5	4.8	5.2	......	6.8	5.1	35	......	19.2	15.2	2.7	2.5
6	4.7	5.0	......	6.7	5.1	22	......	18.0	14.2	2.5	2.3
7	4.2	4.5	......	6.3	5.1	13.3	......	17.5	12.7	2.5	2.3
8	4.2	4.2	......	6.7	5 5	12.2	......	18.0	13.3	2.3	2.3
9	4.7	4.2	......	6.1	5.2	12.2	......	16.6	13.3	3.3	2.3
10	4.7	4.2	......	6.1	5.0	9.2	......	17.1	13.3	3.4	2.1
11	4.5	4.0	......	6.1	5.0	9.1	......	17.5	13.0	3.9	2.1
12	4.5	3.9	......	6.7	4.8	9.0	......	18.0	12.7	4.6	2.1
13	4.5	3.6	......	6.3	5.0	9.0	......	17.1	12.4	4.1	2.0
14	4.2	3.6	22	6.1	4.8	26	......	17.1	12.4	3.4	2.0
15	4.2	3.6	17.5	5.7	5.0	44	......	16.1	12.7	3.4	2.1
16	3.7	3.9	17.5	5.4	5.3	47	......	15.6	13.8	3.0	2.3
17	3.6	5.0	17.5	5.7	13.3	50	......	14.2	18.0	2.8	3.4
18	3.6	27	16.2	5.7	38	50	......	13.8	59	2.8	10.4
19	4.0	32	9.5	6.4	38	35	......	15.6	119	3.0	13.5
20	3.7	36	8.6	5.9	28	23	......	16.1	68	3.0	10.0
21	4.2	27	10.4	10.0	26	21	......	16.6	54	3.6	8.4
22	6.8	19.8	9.5	11.0	15.7	18.2	......	25	42	4.1	6.7
23	14.1	15.0	9.5	12.0	13.3	14.5	......	25	35	4.3	6.4
24	46	18.6	7.1	18.7	18.2	14.5	......	42	38	5.2	6.4
25	21	21	7.1	20.0	23	14.5	......	35	48	4.1	6.4
26	12.7	24	7.1	13.9	23	13.3	......	25	44	3.4	6.4
27	10.0	20	8.6	13.9	15.7	11.2	......	23	38	3.0	5.7
28	7.9	17.4	15.0	9.8	12.2	11.2	......	19.2	36	2.8	5.7
29	6.8	15.0	10.4	8.9	12.2	10.2	......	17.1	32	2.5	5.2
30	6.8	12.7	10.4	9.1	11.2	9.2	......	17.1	29	3.4	4.6
31	9.1	12.0	......	8.5	9.2	......	......	20	25	2.4	4.4
Mean	7.53	12.2	12.0	8.47	12.3	20.5	9.2	19.9	29.4	3.33	4.56
Mean per square mile	0.359	0.581	0.558	0.394	0.572	0.953	0.428	0.221	0.326	0.199	0.273
Run-off (depth in inches on drainage area)	0.41	0.67	0.35	0.45	0.66	1.96	0.03	0.25	0.38	0.23	0.31

[a] The discharges for Sorrels Creek at mouth and Fish Creek at mouth are based on well-defined rating curves.
[b] The channel of Fish Creek below Solo Creek shifted considerably during the period July 1 to August 9. The discharges for this interval were deduced by the indirect method for shifting channels.
[c] The bed of Miller Creek shifted to such an extent that three rating curves were needed to define the discharge, but sufficient measurements were made to render the results good.

Miscellaneous measurements in Chena River drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
July 10	Elliott Creek at mouth	41.5	8.7	0.21
July 31	do	41.5	14.9	.36
July 7	Solo Creek at mouth	5.1	.89	.18
Aug. 9	do	5.1	.76	.15
Aug. 22	do	5.1	2.5	.49
July 7	Bear Creek at mouth	13.8	3.2	.23
Aug. 9	do	13.8	2.6	.19
Aug. 23	do	13.8	6.6	.48
July 7	Fairbanks Creek at mouth	18.9	3.8	.20
Aug. 9	do	18.9	2.7	.14
Aug. 23	do	18.9	7.4	.39
July 6	Miller Creek above Heim Creek	6.0	1.7	.28
Do	Heim Creek at mouth	4.0	.44	.11

CHATANIKA RIVER DRAINAGE BASIN.

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. Its course lies mostly to the west side of the valley, which is from half a mile to 7 miles wide and about 80 miles long. The drainage area of the river above its mouth is approximately 1,300 square miles.

Below the junction of Faith and McManus creeks the stream has a shifting, gravelly bottom. In low and medium stages it flows in a series of pools and rapids in a channel 75 to 200 feet wide; during the high-water period 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 ranging from 8 to 10 feet in height.

Below Poker Creek, a tributary from the right about 40 miles downstream from the junction of Faith and McManus creeks, the valley widens and the bottom lands become marshy and swampy. From the left the Chatanika receives 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; below this 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.

Monthly discharge of Chatanika River for 1907-1910.

Chatanika River below Faith Creek.

[Drainage area, 132 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Mean per square mile.	
1907.					
July 17-31	96	55	67.8	0.514	0.28
August	205	72	125	.947	1.09
September	1,990	119	342	2.59	2.89
The period, 76 days	1,990	55	178	1.31	4.26
1908.					
May 12-20	1,340	320	598	4.53	1.85
July 13-31	200	82	131	.992	.70
August	270	95	137	1.04	1.20
September	530	102	208	1.58	1.76
The period, 89 days	1,340	82	241	1.82	5.51
1910.					
May 25-31	683	320	473	3.58	.93
June	2,000	118	377	2.86	3.19
July	293	48	86.1	.652	.75
August	1,010	49	197	1.49	1.72
Sept. 1-25	430	141	233	1.77	1.65
The period, 124 days	2,000	48	235	1.78	8.24

Chatanika River below Poker Creek.

[Drainage area, 456 square miles.]

Month.	Maximum.	Minimum.	Mean.	Mean per square mile.	Run-off (depth in inches on drainage area).
1907.					
June 20-30	250	192	228	0.500	0.20
July	283	167	211	.463	.53
August	1,160	216	428	.939	1.08
September	3,160	300	954	2.09	2.33
Oct. 1-14	860	232	506	1.11	.47
The period, 117 days	3,160	167	496	1.08	4.61
1908.					
May 16-31	4,120	1,730	2,730	5.99	3.56
June	2,280	283	984	2.16	2.41
July	942	204	332	.728	.84
August	455	192	284	.623	.72
September	1,160	266	461	1.01	1.12
Oct. 1-21	342	179	234	.513	.40
The period, 159 days	4,120	179	699	1.53	9.05
1909.					
May 9-31	3,620	474	1,870	4.10	3.51
June	1,220	152	416	.912	1.02
July	833	219	414	.910	1.05
August	1,740	179	530	1.16	1.34
September	219	130	151	.331	.37
Oct. 1-5	110	92	103	.226	.04
The period, 150 days	3,620	92	598	1.31	7.33
1910.					
May 17-31	1,900	600	944	2.07	1.16
June	3,260	248	686	1.50	1.67
July	822	104	196	.430	.50
August	2,720	95	481	1.05	1.21
September	1,410	298	553	1.21	1.35
Oct. 1-29	352	123	208	.456	.49
The period, 166 days	3,260	95	472	1.04	6.38

Daily discharge, in second-feet, of Chatanika River for 1910.

Day.	Chatanika River below Faith Creek [a] (drainage area, 132 square miles).					Chatanika River below Poker Creek [b] (drainage area, 456 square miles).					
	May.	June.	July.	Aug.	Sept.	May.	June.	July.	Aug.	Sept.	Oct.
1	....	639	109	92	146	....	1,020	269	144	361	280
2	....	632	108	80	144	....	1,020	262	145	350	263
3	....	646	81	70	141	....	892	214	144	351	263
4	....	569	65	65	172	....	861	174	140	376	263
5	....	683	78	62	276	....	682	193	134	674	257
6	....	339	68	62	368	....	600	173	125	967	160
7	....	249	62	60	348	....	600	165	124	561	138
8	....	223	60	58	315	....	500	154	125	502	134
9	....	310	60	56	281	....	456	144	126	471	134
10	....	2,000	58	55	241	....	1,770	132	123	397	132
11	....	1,030	56	55	212	....	3,260	126	122	358	123
12	....	502	55	54	185	....	1,610	130	117	330	126
13	....	302	54	53	162	....	1,460	136	114	315	175
14	....	223	53	51	175	....	1,020	128	111	570	257
15	....	182	52	49	430	....	456	111	95	1,410	352
16	....	202	52	51	310	....	372	110	98	1,120	326
17	....	206	51	68	293	1,900	333	127	142	1,060	298
18	....	144	51	477	268	1,560	298	104	455	917	277
19	....	149	49	1,010	238	655	280	127	2,020	723	263
20	....	157	48	907	216	600	263	133	2,720	625	239
21	....	182	53	477	209	1,020	263	136	1,720	581	205
22	....	339	99	245	202	988	248	112	923	569	200
23	....	220	276	175	182	655	347	218	1,010	551	180
24	....	202	293	202	154	800	329	544	624	445	180
25	683	178	127	260	146	1,350	294	822	503	376	180
26	329	172	102	276	....	655	296	268	502	361	180
27	320	202	92	260	....	655	263	212	499	357	168
28	348	157	75	238	....	600	250	186	484	305	134
29	477	141	70	209	....	600	252	170	480	298	134
30	542	118	106	175	....	955	270	161	445	298	....
31	610	....	106	157	....	1,160	....	146	396	....	....
Mean	473	377	86.1	197	233	944	686	196	481	553	208
Mean per square mile	3.58	2.86	0.652	1.49	1.77	2.07	1.50	0.430	1.05	1.21	0.456
Run-off (depth in inches on drainage area)	0.93	3.19	0.75	1.72	1.65	1.16	1.67	0.50	1.21	1.35	0.49

[a] The discharges for Chatanika River below Faith Creek are based on a well-defined rating curve.

[b] The discharges of Chatanika River below Poker Creek are obtained by adding to the flow of the river the amount of water diverted by the Chatanika ditch. It was not possible to determine the discharge of the ditch accurately on account of shifting channel conditions, but as the flow was uniform and not a large percentage of the total it is thought that the values given are correct within 5 to 10 per cent. A fish dam built below the gage resulted in a backwater effect on the gage from July 3 to Aug. 13, when the dam was washed out.

Daily discharge, in second-feet, of McManus, Charity, and Homestake creeks for 1910.

Day.	McManus Creek at mouth [a] (drainage area, 80 square miles).					Charity Creek above Homestake Creek.[b]					Homestake Creek at mouth [b] (drainage area, 5.6 square miles).		
	May.	June.	July.	Aug.	Sept.	May.	June.	July.	Aug.	Sept.	May.	June.	July.
1	......	242	23	42	64	......	60	......	4.0	14.8	......	42	3.0
2	......	183	23	34	59	......	42	......	3.8	13.3	......	35	2.8
3	......	175	24	32	59	......	77	......	3.6	11.8	......	42	2.3
4	......	152	23	26	80	......	44	......	3.4	14.8	......	27	2.0
5	......	225	42	23	160	......	41	......	3.2	13.5	......	35	2.9
6	......	156	36	23	199	......	32	......	3.2	12.0	......	20	2.6
7	......	104	23	23	187	......	27	......	3.2	10.0	......	17.4	2.6
8	......	85	23	21	168	......	42	......	3.2	9.0	......	15.2	2.7
9	......	120	22	19.0	141	......	55	......	3.2	8.0	......	34	2.8
10	......	760	21	18.0	120	......	77	......	3.2	7.0	......	56	2.9
11	......	486	21	17.0	104	......	41	3.6	3.2	7.0	......	36	2.9
12	......	277	21	17.0	80	......	......	3.5	3.2	7.0	......	17.4	......
13	......	152	21	15.0	69	......	......	3.4	3.2	7.0	......	11.0	......
14	......	104	20	15.0	97	......	......	3.3	3.1	7.0	......	8.4	......
15	......	85	19.0	13.0	282	......	......	3.2	3.0	7.0	......	8.0	......
16	......	85	19.0	13.0	225	......	......	3.2	6.0	7.0	......	11.0	......
17	......	69	18.0	16.0	187	......	......	3.2	9.0	7.0	......	8.8	......
18	......	59	17.0	42	160	......	......	3.2	12.0	7.0	......	7.4	......
19	......	57	17.0	277	138	......	......	3.2	17.9	7.0	......	7.4	......
20	......	53	17.0	387	152	......	......	3.2	......	7.0	......	7.7	......
21	......	59	18.0	183	148	......	......	5.1	......	7.0	......	30	......
22	......	277	24	104	138	......	......	5.1	......	7.0	......	22	......
23	......	110	32	75	94	......	......	7.2	......	7.0	......	11.0	......
24	......	97	110	94	80	......	......	9.4	......	7.0	......	9.1	......
25	359	91	55	130	72	......	......	8.0	......	7.0	......	5.3	......
26	183	80	32	145	......	22	......	7.0	......	7.0	16.3	4.6	......
27	160	100	23	138	......	22	......	6.0	......	7.0	49	4.2	......
28	175	97	23	123	......	32	......	4.0	......	7.0	39	4.2	......
29	242	72	21	107	......	44	......	3.2	......	......	29	4.6	......
30	255	30	51	85	......	60	......	5.1	......	......	42	4.6	......
31	277	......	59	69	......	77	......	4.3	......	......	50	......	......
Mean	236	155	29.0	75.0	131	42.8	48.9	4.64	4.98	8.58	37.6	18.2	2.68
Mean per square mile	2.95	1.94	0.362	0.938	1.64	......	......	......	......	......	6.71	3.25	0.479
Run-off (depth in inches on drainage area)	[a]0.77	2.16	0.42	1.08	1.52	......	......	......	......	......	1.50	3.63	0.20

[a] The discharges of McManus creek at mouth are based on a rating curve that is well defined between 50 and 400 second-feet.
[b] The discharges of Charity and Homestake creeks are only approximate on account of shifting channel conditions and insufficient measurements.

Miscellaneous measurements in the Chatanika River drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-feet.*	*Sec.-feet.*
July 10	Smith Creek above Pool Creek	17	5.4	0.32
Aug. 1	....do	17	7.3	.43
July 10	Pool Creek at mouth	14	4.8	.34
Aug. 1	....do	14	8.8	.63
July 10	Hope Creek at mouth	20.3	12.3	.61
July 31	....do	20.3	23	1.13
July 10	Deep Creek at mouth	10.8	2.4	.22
Do	Orphan Boy Creek at mouth	....	1.4	....
Aug. 2	First tributary below Sourdough Creek from right side at mouth.	5.1	1.5	.29
Do	Cripple Creek at mouth	12.3	2.8	.23
Do	Cassiar Creek at mouth	7.3	.72	.10
July 8	Flat Creek below Third Pup	7.0	1.1	.16
Aug. 2	Flat Creek below First Pup	16.9	3.6	.21
Aug. 3	Juniper Creek at mouth	8.7	2.0	.23
Do	Kokomo Creek above Rusty Gold Creek	26.1	3.8	.15
Aug. 5	Poker Creek at mouth	40.0	8.8	.22
Do	Poker Creek ditch near outlet	....	5.3	....

GOLDSTREAM CREEK DRAINAGE BASIN.

Goldstream Creek flows southwestward, in a narrow, winding course, between the drainage basin of Chatanika River on the right and the Little Chena and Tanana basins 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 upper portion of the valley is drained by Pedro and Gilmore creeks, which join to form Goldstream Creek near Gilmore, about 12 miles north of Fairbanks. Fox Creek enters the main stream from the right about 2 miles below this junction.

Miscellaneous measurements in Goldstream Creek drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-feet.*	*Sec.-feet.*
June 29...	Gilmore Creek near mouth....	10.7	6.5	0.61
Do....	Pedro Creek near mouth....	14.3	6.1	.43
Aug. 10..	Fox Creek near mouth....	7.4	.45	.061

SALCHAKET DISTRICT.

DESCRIPTION.

The Tanana precinct, which includes the Salchaket district, embraces the area drained by the Tanana and its tributaries from and including Salcha River to a point on Tanana River south of Lake Mansfield. The larger streams included in this area are Salcha, Goodpaster, Volkmar, and Healy rivers from the north and Delta River from the south.

TANANA RIVER DRAINAGE BASIN.

Tanana River rises near the international boundary line and flows in a general northwesterly direction for about 440 miles to its junction with Yukon River at Fort Gibbon.

The river in general follows the north side of the valley and is one maze of channels and islands. At McCartys, just above the mouth of Delta River, which is 95 miles from Fairbanks by the Government road, it flows in three channels except at extreme low water, when the middle one is dry. During the summer of 1909 the Alaska Road Commission installed ferries on the right and left channels and bridged the center one.

Tenderfoot and Banner creeks, which have been the largest gold producers in the district, are tributary to the Tanana about 75 miles northeast of Fairbanks, at a point about halfway between Goodpaster and Salcha rivers and from the same side.

Canyon Creek is a small stream which flows into the main stream from the north about 5 miles below Richardson.

Salcha River rises opposite the head of the South Fork of Birch Creek, about 25 miles from the Yukon. The average fall of the river from the Splits to the mouth is 10 feet to the mile, and from a point about 2 miles from the summit of the divide at the headwaters it averages 19 feet to the mile. At the mouth, which is 40 miles from Fairbanks, a ferry, post office, store, and roadhouse are located and good accommodations are at hand for the traveler. Redmond Creek enters the Salcha from the south about 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.

Little Salcha River, which is tributary to the Tanana from the east, enters the river at a point midway between the town of Salchaket and the Salcha telegraph station.

GAGING STATIONS AND MEASURING POINTS.

The following list gives the locations at which gaging stations were maintained or discharge measurements made in 1910 in the Salchaket district:

Gaging stations and measuring points in Salchaket district, 1910.

- Tanana River drainage basin:
  - Banner Creek at mouth.
  - Canyon Creek near mouth.
  - Salcha River at mouth.
    - Junction Creek above Moose Lake outlet.
  - Little Salcha River at road crossing.

Monthly discharge of Salcha River at mouth for 1909-10.

[Drainage area, 2,170 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Mean per square mile.	
1909.					
July 4-31	9,130	1,630	3,830	1.76	1.83
August	7,460	1,750	3,690	1.70	1.96
September	1,730	1,350	1,460	.67	.75
The period, 89 days	9,130	1,350	2,980	1.37	4.54
1910.					
May 12-31	6,640	2,180	3,040	1.40	1.04
June	8,220	1,740	3,560	1.64	1.83
July	6,120	1,120	2,000	.920	1.06
Aug. 1-19	5,590	930	1,880	.866	.61
The period, 100 days	8,220	930	2,990	1.38	4.54

Daily discharge, in second-feet, of Banner Creek, Salcha River, and Junction Creek for 1910.

Day.	Banner Creek near mouth[a] (drainage area, 21.5 square miles).				Salcha River at mouth[b] (drainage area, 2,170 square miles).				Junction Creek above Moose Lake outlet[a] (drainage area, 23.6 square miles).			
	June.	July.	Aug.	Sept.	May.	June.	July.	Aug.	June.	July.	Aug.	Sept.
1	......	6.1	19.3	7.2	......	4,390	4,150	3,090	......	5.3	30	4.6
2	......	4.0	14.0	7.8	......	4,050	3,360	2,660	......	4.6	20	6.7
3	......	3.1	12.2	8.8	......	3,360	2,740	2,180	......	4.3	14.5	6.2
4	......	3.1	8.8	10.5	......	3,090	2,040	1,640	......	4.3	8.6	6.2
5	......	7.8	7.2	11.2	......	2,520	1,760	1,520	......	5.8	5.8	25
6	......	7.8	5.6	10.5	......	2,660	2,260	1,310	......	6.2	4.6	22
7	......	7.8	5.6	10.5	......	2,300	2,040	1,310	......	5.8	4.3	14.5
8	......	6.1	5.0	9.8	......	1,740	1,580	1,310	8.6	4.6	4.3	10.2
9	......	4.6	5.0	8.8	......	3,000	1,310	1,260	7.2	4.6	4.3	8.6
10	......	4.6	5.0	7.8	......	6,010	1,160	1,120	269	4.3	4.0	8.6
11	......	3.1	5.0	7.8	......	7,480	1,120	1,120	193	3.8	4.0	7.9
12	......	3.1	4.2	8.8	4,130	8,220	1,120	1,120	85	5.3	3.8	7.2
13	......	3.1	4.2	12.2	5,780	7,060	1,420	1,120	41	4.6	3.8	7.2
14	......	2.5	2.7	11.2	6,320	5,170	2,040	1,000	17.3	4.3	4.0	9.4
15	......	2.5	2.7	11.2	6,180	3,360	1,970	930	11.2	3.8	4.3	12.2
16	......	2.0	5.6	17.5	6,640	2,660	1,760	930	9.4	3.8	4.3	20
17	......	2.5	5.0	15.7	5,000	3,270	1,420	2,480	7.9	3.8	4.6	34
18	......	2.5	5.6	8.8	6,010	2,920	1,120	4,030	6.2	3.8	5.0	27
19	......	2.5	9.6	12.2	4,650	2,580	1,120	5,590	5.8	3.8	7.2	14.5
20	4.6	2.5	12.9	10.5	4,350	2,480	1,310	......	5.3	4.3	10.2	11.2
21	4.0	2.5	10.5	8.8	4,710	2,380	1,210	......	5.0	3.0	12.2	11.2
22	4.0	3.1	9.6	10.5	3,750	2,270	1,120	......	4.6	4.0	7.9	......
23	4.0	11.1	8.8	12.2	3,180	2,550	1,120	......	4.6	10.2	6.2	......
24	4.0	11.1	8.8	14.0	3,910	2,830	2,830	......	4.3	10.2	5.8	......
25	4.0	4.6	8.2	15.7	5,480	2,830	6,120	......	4.0	17.3	5.8	......
26	13.5	3.1	8.2	15.0	5,550	2,830	2,740	......	4.6	12.2	5.3	......
27	7.8	3.1	7.8	14.0	4,050	3,950	2,410	......	5.3	8.6	5.3	......
28	7.8	2.5	7.8	15.7	3,750	3,180	2,110	......	5.3	6.2	5.0	......
29	7.8	3.1	7.2	14.0	3,750	3,000	1,520	......	5.0	4.6	4.6	......
30	7.8	23	7.2	12.2	2,180	2,740	1,520	......	5.3	3.8	4.3	......
31	......	26	7.2	......	4,750	......	2,490	......	......	34	4.3	......
Mean	6.30	5.63	7.63	11.4	3,040	3,560	2,000	1,880	3.11	6.62	7.04	13.1
Mean per square mile	0.293	0.262	0.355	0.530	1.40	1.64	0.920	0.866	1.32	0.281	0.298	0.555
Run-off (depth in inches on drainage area)	0.12	0.30	0.41	0.59	1.04	1.83	1.06	0.61	1.13	0.32	0.34	0.43

[a] The discharges at Banner and Junction creeks are only approximate on account of shifting channel conditions and insufficient measurements.

[b] The discharges of Salcha River at mouth are based on a rating curve that is well defined throughout.

Miscellaneous measurements in Salchaket district in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-feet.*	*Sec.-feet.*
June 21	Canyon Creek near mouth	4.7	0.45	0.091
June 22	Little Salcha River at road crossing	70	28	.40
Aug. 15	do	70	21	.30

CIRCLE DISTRICT.

DESCRIPTION.

The area north of the Yukon-Tanana divide between longitude 143° 40′ and 146° 50′ is known as the Birch Creek region of the Circle district. Generally speaking, it consists of two geographic divisions—a low, broad alluvial plain and a dissected plateau.

The northwestern portion of the low, broad plain forms the bottom lands of the Yukon Flats north of Crazy Mountains; the southeastern portion is an irregular area surrounded by a low ridge along the

Yukon, the Crazy Mountains, and the range of hills 20 to 40 miles farther south. This portion is cut by Birch and Crooked creeks; it is well timbered along these streams and contains large areas of meadow-like swamp land that furnish forage for both summer and winter use.

The plateau division, whose longer diameter trends east and west, lies between two distinct ridges—the eastern extensions of the White Mountains. The ridge to the south is high and barren and forms the main Yukon-Tanana divide; that to the north is lower, irregular, and barren, separates the upper tributaries of the Birch Creek basin from the lower, and is itself divided by the deep canyon-like gorge through which Birch Creek flows on its way to the Yukon.

At elevations of 2,000 feet or more above sea level the country is as a rule barren and rocky; below this altitude, especially in the flats where Birch and Crooked creeks join, considerable timber is found.

GAGING STATIONS AND MEASURING POINTS.

The following list gives the locations at which gaging stations were maintained or discharge measurements made in 1910 in the Circle district:

Gaging stations and measuring points in Circle district, 1910.

- Birch Creek drainage basin:
  - Birch Creek below Clums Fork.
  - Birch Creek at Fourteenmile House.
  - Fryingpan Creek below forks.
  - Great Unknown Creek near mouth.
  - Clums Fork at mouth.
  - McLean Creek at mouth.
  - North Fork of Birch Creek drainage basin:
    - North Fork of Birch Creek above Twelvemile Creek.
    - Ptarmigan Creek at mouth.
    - Golddust Creek 4½ miles above mouth.
    - Butte Creek at mouth.
    - Bear Creek at mouth.
    - Twelvemile Creek at mouth.
    - East Fork of Twelvemile Creek at mouth.
  - Crooked Creek drainage basin:
    - Crooked Creek at Central House.
    - Porcupine Creek above ditch.
    - Porcupine Creek below Bonanza Creek.
    - Bonanza Creek above ditch intake.
    - Mammoth Creek at Miller House.
    - Mammoth Creek ditch at intake.
    - Independence Creek at mouth.
    - Miller Creek at claim "No. 6 above."
    - Miller Creek at mouth.
    - Boulder Creek at trail crossing.
    - Deadwood Creek above Switch Creek.
  - Preacher Creek drainage basin:
    - Preacher Creek above Bachelor Creek.
    - Bachelor Creek below Costa Fork.
    - Bachelor Creek at mouth.
    - Costa Fork at mouth.

BIRCH CREEK DRAINAGE BASIN.

Birch Creek flows into Yukon River at a point 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 watercourses, and in outline the basin is extremely unsymmetrical. The headwaters interlock with those of Little Chena and Chatanika rivers and flow east for about 60 miles to the junction of the South Fork, where the stream makes an abrupt turn northward. About 12 miles beyond this point it leaves the mountainous country and enters the lowlands of the Yukon, through which it sluggishly flows in a meandering channel for over 100 miles, roughly paralleling the Yukon at a distance varying from 10 to 20 miles.

The principal tributaries from the south and east are Clums Fork and the South Fork. From the north and west the North Fork and Harrison, Crooked, and Preacher creeks are the chief branches. The headwaters of the South Fork rise opposite those of Salcha and Charley rivers.

Monthly discharge of Birch Creek at Fourteenmile House for 1908 to 1910.

[Drainage area, 2,150 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Mean per square mile.	
1908.					
June 26-30	1,190	1,020	1,090	0.507	0.09
July	2,630	847	1,140	.530	.61
August	1,620	825	1,080	.502	.58
Sept. 1-29	6,070	900	2,150	1.00	1.08
The period, 96 days	6,070	825	1,423	1.48	2.36
1909.					
May 15-31	9,970	3,320	5,930	2.76	1.74
June	8,640	1,860	3,410	1.59	1.77
July	8,280	960	2,200	1.02	1.18
August	3,020	974	1,830	.851	.98
September	960	730	799	.372	.42
Oct. 1-2	792	792	792	.368	.03
The period, 141 days	9,970	730	2,510	1.17	6.12
1910.					
May 13-31	6,620	3,200	4,790	2.23	1.58
June	6,000	1,160	2,500	1.16	1.29
July	5,460	551	1,430	.665	.77
August	1,880	432	950	.442	.51
September	3,280	1,040	1,620	.753	.84
Oct. 1-6	1,140	1,080	1,090	.507	.11
The period, 147 days	6,620	432	2,010	.935	5.10

Daily discharge, in second-feet, of Birch Creek and Fryingpan Creek for 1910.

Day.	Birch Creek below Clums Fork [a] (drainage area, 600 square miles).				Birch Creek at Fourteenmile House [b] (drainage area, 2,150 square miles).						Fryingpan Creek below the forks [c] (drainage area, 15.9 square miles).		
	June.	July.	Aug.	Sept.	May.	June.	July.	Aug.	Sept.	Oct.	June.	July.	Aug.
1		1,010	550	457		4,070	3,690	1,680	1,040	1,140		6.7	4.6
2		604	424	508		3,370	2,860	1,430	1,180	1,080		5.8	3.8
3		391	353	487		2,900	2,070	1,200	1,430	1,080		5.2	3.4
4		296	272	497		2,810	1,680	984	1,410	1,080		4.9	3.2
5		2,610	237	666		2,420	1,610	756	1,380	1,080		6.7	2.8
6		1,370	220	881		2,190	5,460	735	1,650	1,080		6.5	2.6
7		816	188	684		1,840	3,060	648	1,680			5.4	2.4
8	518	539	175	593		1,590	2,360	587	1,550		5.4	4.9	2.4
9	566	409	164	539		1,480	1,810	605	1,380		11.2	4.8	2.3
10	2,030	349	147	497		2,040	1,200	648	1,250		17.0	4.5	2.3
11	2,610	296	147	477		3,950	1,030	623	1,200		15.2	5.7	2.3
12	2,660	284	142	438		6,000	968	575	1,200		13.6	6.2	2.2
13	1,420	307	125	396	3,810	4,920	900	527	1,120		12.0	7.2	2.2
14	848	258	120	424	4,260	2,980	830	471	1,140		10.5	5.8	2.1
15	604	207	123	1,810	5,240	2,260	760	460	1,180		8.9	5.4	2.0
16	604	169	120	1,860	6,120	1,930	690	432	2,840		7.3	4.9	2.2
17	529	161	125	1,760	6,070	1,680	620	432	3,280		5.7	4.3	2.1
18	462	276	357	1,560	5,880	1,600	551	449	3,220		5.4	6.5	
19	383	409	1,710	1,230	5,020	1,460	952	605	2,800		5.1	5.8	
20	374	296	1,130	848	4,540	1,370	1,200	1,880	2,320		4.9	5.3	
21	400	233	720	783	4,260	1,280	920	1,550	1,780		7.2	5.4	
22	2,080	227	577	649	4,210	1,560	808	1,360	1,510		8.8	5.8	
23	1,100	269	539	593	4,370	3,320	770	1,180	1,430		6.8	6.0	
24	733	550	457	561	4,730	2,440	808	960	1,410		6.0	6.3	
25	467	561	572	577	6,140	1,460	1,120	1,000	1,380		5.3	5.7	
26	378	353	783	599	6,620	1,250	1,200	1,230	1,410		5.1	2.7	
27	344	276	745	561	6,000	1,160	1,020	1,410	1,450		5.1	2.6	
28	396	233	835	555	3,670	1,710	830	1,380	1,430		5.3	2.5	
29	1,150	194	696	524	3,370	4,110	770	1,300	1,320		5.2	2.5	
30	1,680	340	599	438	3,200	3,900	770	1,230	1,200		9.0	11.0	
31		752	524		3,460		936	1,120				7.6	
Mean	971	485	448	748	4,790	2,500	1,430	950	1,620	1,090	8.09	5.50	2.64
Mean per square mile	1.62	0.808	0.747	1.25	2.23	1.16	0.665	0.442	0.753	0.507	0.509	0.346	0.166
Run-off (depth in inches on drainage area)	1.38	0.93	0.86	1.40	1.58	1.29	0.77	0.51	0.84	0.11	0.44	0.40	0.10

[a] The discharges of Birch Creek below Clums Fork are based on a well-defined rating curve below 700 second-feet. Above 700 second-feet the curve was extended by means of the area and velocity curves, and it is believed to represent the true relation of gage height to discharge up to 2,000 second-feet.

[b] The discharges of Birch Creek at Fourteenmile House are based on a rating curve well defined between 500 and 2,300 second-feet.

[c] The discharges of Fryingpan Creek are based on a rating curve well defined between 2.5 and 5.5 second feet.

Miscellaneous measurements in Birch Creek drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
July 26	Great Unknown Creek near mouth	41.2	16.7	0.40
July 25	Clums Fork at mouth	172	118	.69
Do	McLean Creek at mouth	15.4	3.0	.20

NORTH FORK OF BIRCH CREEK DRAINAGE BASIN.

Eagle and Ptarmigan creeks, whose headwaters are opposite those of Crooked Creek, join to form the North Fork of Birch Creek. Below the junction the North Fork takes a southwestward course 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. Here its waters unite with those of Harrington Fork to form Birch Creek proper, which flows east to its confluence with the South Fork, a distance of approximately 45 miles.

Beginning at the head, the main tributaries from the north are Fish, Bear, and Twelvemile creeks. From the south, in the same order, Golddust and Butte creeks are the only important streams.

Miscellaneous measurements in North Fork of Birch Creek drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
July 28	North Fork of Birch Creek above Twelvemile Creek.	87.1	55	0.63
Do	Ptarmigan Creek at mouth	19.0	15.0	.79
July 27	Golddust Creek 4½ miles above mouth	9.5	8.6	.90
July 28	Butte Creek at mouth	9.2	2.2	.24
Do	Bear Creek at mouth	12.4	6.7	.54
July 13	Twelvemile Creek at mouth	44.5	18.9	.42
July 28	do	44.5	14.6	.33
June 9	East Fork of Twelvemile Creek at mouth	22.9	60.0	2.62
July 13	do	22.9	7.4	.32
July 28	do	22.9	9.2	.40

CROOKED CREEK DRAINAGE BASIN.

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 the Fourteenmile House. Not far below the 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 about 2 miles below this junction from the west. The total length of that portion of the stream called Mammoth Creek is less than 4 miles.

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

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

Daily discharge, in second-feet, of Crooked, Porcupine, and Bonanza creeks for 1910.

Day.	Crooked Creek at Central House[a] (drainage area, 161 square miles).				Porcupine Creek[b] above ditch intake (drainage area, 17.8 square miles).		Porcupine Creek below Bonanza Creek[c] (drainage area, 39.9 square miles).					Bonanza Creek[b] above ditch intake (drainage area, 7.9 square miles).	
	May.	June.	July.	Aug.	July.	Aug.	May.	June.	July.	Aug.	Sept.	June.	July.
1	......	139	348	173	15	23	......	100	38	42	9.7	38	19
2	......	173	173	91	12	17.7	......	82	29	31	9.7	32	15
3	......	225	112	74	10	11.4	......	102	23	25	9.5	36	10
4	......	234	74	61	9.2	11.4	......	85	19.7	22	9.3	30	9
5	......	126	112	50	14	8.8	......	73	48	17.8	10.9	29	32
6	......	139	192	45	11	7.1	......	64	38	10.9	12.4	23	25
7	......	112	112	32	5.0	6.7	......	49	27	12.6	12.4	20	14
8	......	102	74	29	5.0	6.7	......	43	23	11.6	11.8	20	12
9	......	91	68	......	3.7	5.4	......	68	24	10.9	11.6	24	13
10	......	300	61	......	5.0	5.0	......	131	19.9	10.5	11.3	42	10
11	......	255	56	......	4.5	4.5	......	92	18.1	10.5	11.3	35	9
12	......	212	50	......	3.7	4.0	......	77	17.2	9.7	11.3	30	8
13	......	173	45	......	3.7	4.0	......	60	17.0	9.7	10.9	21	8
14	......	139	40	......	4.0	3.7	......	46	15.6	9.3	11.3	16	7
15	173	112	36	......	4.0	3.7	......	44	10.9	9.0	38	15	5
16	173	102	33	......	2.9	3.7	......	55	10.1	9.3	40	19	5
17	112	112	30	......	3.0	3.2	......	46	10.5	9.3	32	16	5
18	102	102	255	......	30	3.7	......	36	71	9.5	26	12	30
19	91	82	173	......	27	......	......	41	40	9.3	22	14	18
20	112	74	126	......	17.7	......	......	57	28	9.9	17.6	19	13
21	126	112	102	......	12.8	......	......	174	24	9.8	......	28	11
22	139	348	112	......	10.1	......	......	134	22	9.8	......	30	10
23	112	255	126	......	9.2	......	......	62	22	9.7	......	27	11
24	139	173	112	......	11.9	......	......	49	29	9.7	......	24	16
25	212	112	91	......	11.4	......	......	36	25	9.7	......	15	12
26	112	91	74	......	9.6	......	......	36	20	10.3	......	18	9
27	74	91	61	......	8.4	......	......	43	18.5	10.7	......	18	8
28	50	173	50	......	7.1	......	......	46	12.9	10.5	......	20	8
29	173	397	40	......	7.1	......	51	76	16.2	10.1	......	35	8
30	234	448	32	......	62	......	73	60	173	9.9	......	30	27
31	300	......	212	......	41	......	127	......	74	9.7	......	......	30
Mean	143	173	103	69.4	12.3	7.43	83.7	68.9	31.1	12.9	16.4	24.5	13.5
Mean per square mile	0.888	1.07	0.640	0.431	0.691	0.417	2.10	1.73	0.779	0.323	0.411	3.10	1.71
Run-off (depth in inches on drainage area)	0.56	1.19	0.74	0.13	0.80	0.28	0.23	1.93	0.90	0.37	0.32	3.46	1.97

[a] Discharges of Crooked Creek at Central House are based on a rating curve well defined between 30 and 350 second-feet.

[b] The discharges of Porcupine and Bonanza creeks above ditch intakes are only approximate on account of shifting channel conditions.

[c] The discharges of Porcupine Creek below Bonanza Creek are based on a rating curve fairly well defined between 10 and 60 second-feet.

Daily discharge, in second-feet, of Mammoth and Deadwood creeks for 1910.

Day.	Mammoth Creek at Miller House [a] (drainage area, 37.1 square miles).			Deadwood Creek above Switch Creek [b] (drainage area, 21.3 square miles).				
	May.	June.	July.	May.	June.	July.	Aug.	Sept.
1	......	80	47	......	58	68	15.3	5.0
2	......	95	25	......	58	25	11.0	5.5
3	......	77	21	......	55	15.3	8.7	5.0
4	......	66	30	......	39	13.2	7.7	5.0
5	......	66	90	......	35	18.2	6.4	5.8
6	......	62	54	......	27	13.2	6.4	6.4
7	......	54	33	......	27	11.0	5.8	5.0
8	......	54	25	......	16.4	11.0	5.8	5.0
9	......	63	17.5	......	39	7.7	5.0	5.0
10	......	79	17.5	......	35	6.4	5.0	5.0
11	......	64	17.5	......	41	6.4	5.0	5.2
12	......	63	17.5	......	31	5.8	4.5	5.5
13	......	58	17.5	......	27	5.0	4.5	6.4
14	......	49	21	......	21	5.0	4.3	7.7
15	......	48	17.5	......	21	5.0	3.8	25
16	......	53	14.8	......	21	4.5	3.8	18.2
17	30	51	19.0	......	21	8.4	3.8	18.2
18	47	30	11.8	......	15.3	50	5.0	15.3
19	47	32	49	......	15.3	25	5.5	13.2
20	35	49	37	......	18.2	13.2	6.4	11.0
21	25	91	36	......	21	13.2	5.7	......
22	17.5	77	25	......	25	13.2	5.0	......
23	54	61	25	......	21	8.7	4.5	......
24	70	33	35	......	15.3	8.4	3.8	......
25	47	25	25	......	13.2	7.2	5.5	......
26	45	53	21	......	11.0	6.4	5.0	......
27	44	67	17.5	......	11.0	5.5	6.4	......
28	41	47	16.4	......	98	5.5	5.0	......
29	65	115	14.8	......	102	9.4	5.8	......
30	78	47	48	66	44	27	5.5	......
31	93	......	38	77	......	19.9	5.0	......
Mean	49.2	60.3	32.0	71.5	32.8	14.2	5.84	8.92
Mean per square mile	1.33	1.63	0.863	0.336	1.54	0.667	0.274	0.414
Run-off (depth in inches on drainage area)	0.74	1.82	0.99	0.25	1.72	0.77	0.32	0.31

[a] The discharges of Mammoth Creek below Miller House are obtained by adding to the discharge of the creek the amount of water diverted by the Mammoth Creek mining ditch. They are only approximate for certain periods during low water on account of insufficient data regarding the flow of the ditch.

[b] The discharges of Deadwood Creek above Switch Creek are based on a well-defined curve throughout.

Daily discharge, in second-feet, of Bonanza Creek ditch at intake for 1910.

Day.	May.	June.[a]	July.[a]	Aug.	Day.	May.	June.[a]	July.[a]	Aug.
1	......	18.9	19.0	17.6	21	......	18.9	10.5	......
2	......	19.2	13.0	13.1	22	......	0	10.2	......
3	......	21	9.6	10.2	23	......	0	10.5	......
4	......	23	8.4	8.4	24	......	24	15.7	......
5	......	23	28	6.9	25	......	14.4	11.9	......
6	......	20	20	......	26	......	15.7	8.7	......
7	......	17.3	13.3	......	27	......	17.3	8.0	......
8	......	16.0	11.5	......	28	14.7	16.9	0	......
9	......	20	12.4	......	29	14.4	26	0	......
10	......	22	9.4	......	30	13.2	28	26	......
11	......	23	8.4	......	31	15.0	......	27	......
12	......	23	7.7	......					
13	......	20	7.7	......	Mean	14.3	17	11.6	11.2
14	......	16.0	6.6	......					
15	......	14.2	0	......					
16	......	18.6	0	......					
17	......	15.4	0	......					
18	......	12.1	27	......					
19	......	13.8	17.6	......					
20	......	18.9	12.2	......					

[a] A change in the relation of gage height to discharge occurred during the period June 6 to July 15. Discharges for this interval were derived by the indirect method for shifting channels.

Miscellaneous measurements in Crooked Creek drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
May 29	Mammoth Creek ditch at intake		33	
June 5	.....do		34	
July 14	Independence Creek at mouth	13.2	4.6	0.35
July 23	.....do	13.2	6.8	.52
May 29	Miller Creek at claim "No. 6 above"	7.2	11.1	1.54
June 5	.....do	7.2	17.4	2.42
July 14	.....do	7.2	3	.42
Do	Miller Creek at mouth	10.5	3	.29
July 23	.....do	10.5	6	.57
July 21	Boulder Creek at trail crossing	38.8	25	.64

PREACHER CREEK DRAINAGE BASIN.

Preacher Creek rises near the headwaters of Chatanika River and Beaver Creek and flows generally northeastward for about 65 miles, entering Birch Creek about 50 miles from the Yukon. It drains an area of 1,090 square miles, ranging in elevation from over 5,000 feet at the head to about 700 feet at the Birch Creek flats.

The main tributaries are the North Fork from the north and Loper and Rock creeks from the south. Bachelor Creek is a small but economically important branch from the south near the head.

Daily discharge in second-feet of Bachelor Creek below Costa Fork for 1910.[1]

[Drainage area, 11.4 square miles.]

July 11	6.6	July 21	7.6
July 12	6.4	July 25	8.1
July 13	5.9	July 26	7.6
July 14	5.3	July 27	7.4
July 15	5.2	July 28	7.1
July 16	5.0	July 29	7.0
July 17	5.6	July 30	8.5
July 18	8.5		
July 19	8.2	Mean	6.93
July 20	7.8		

Miscellaneous measurements in Preacher Creek drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
July 29	Preacher Creek above Bachelor Creek	94.7	45	0.48
Do	Bachelor Creek at mouth	26.4	7.6	.29
July 11	Costa Fork at mouth	4.5	2.1	.47

[1] The discharges are only approximate on account of shifting channel conditions.

FORTYMILE DISTRICT.

LOCATION OF AREA.

It seems desirable in a water-supply discussion to make the boundaries of the districts described coincide with those of certain drainage areas rather than to make them conform with those of precincts or recording districts, which may include partial drainage areas, as in the Fortymile and Eagle precincts. Therefore the Fortymile district will be considered to be the area drained by Fortymile River and its tributaries. This area has been topographically surveyed and is covered by three maps[1] separately published or in process of publication. The topography, geology, and gold placers of this area have been described by Prindle.[2]

GAGING STATIONS AND MEASURING POINTS.

The following list gives the locations at which gaging stations were maintained or discharge measurements made in 1910 in the Fortymile district:

Gaging stations and measuring points in Fortymile district, 1910.

- Fortymile River drainage basin:
    - Fortymile River at Steele Creek.
    - King Solomon Creek at mouth.
    - Liberty Creek at mouth.
    - Dome Creek at trail crossing.
    - Steele Creek at mouth.
    - Canyon Creek below Squaw Gulch.
    - Squaw Gulch at claim "No. 1 above."
    - South Fork of Fortymile River drainage basin:
        - South Fork of Fortymile River below Franklin Creek.
        - Mosquito Fork below Kechumstuk Creek.
        - Kechumstuk Creek at mouth.
        - Gold Creek above Willow Creek.
        - Gold Creek 1 mile above mouth.
        - Walker Fork above Poker Creek.
        - Walker Fork above Twelvemile Creek.
        - Poker Creek one-half mile above mouth.
        - Davis Creek 1 mile above mouth.
        - Wade Creek at claim "No. 10 above."
        - Napoleon Creek at mouth.
        - Buckskin Creek above Fortyfive Pup.
        - Fortyfive Pup at claim No. 13.

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[1] Fortymile quadrangle: Maps can be obtained from the Director, U. S. Geol. Survey, Washington, D. C., at 5 cents per copy.

Circle quadrangle: Contained in Bulletin 295, which can be obtained from the Director, U. S. Geol. Survey; also in print as a separate publication, price 10 cents.

Area south of Circle and Fortymile quadrangles: In process of compilation.

[2] Prindle, L. M., The gold placers of the Fortymile, Birch Creek, and Fairbanks regions, Alaska: Bull. U. S. Geol. Survey No. 251, 1905.

Fortymile River drainage basin—Continued.
- North Fork of Fortymile River drainage basin:
  - North Fork of Fortymile River above Slate Creek.
  - North Fork of Fortymile River above Middle Fork.
  - North Fork of Fortymile River at the "kink."
  - Slate Creek at mouth.
  - Champion Creek below Arkansas Creek.
  - Champion Creek above Bear Creek.
  - Champion Creek at mouth.
  - Bear Creek at mouth.
  - Middle Fork of Fortymile River at mouth.
  - Bullion Creek at mouth.
  - Hutchinson Creek below Confederate Creek.
  - Hutchinson Creek below Montana Creek.
  - Montana Creek at claim No. 7.

FORTYMILE RIVER DRAINAGE BASIN.

Fortymile River[1] is tributary to Yukon River at longitude 140° 30′ west and latitude 64° 30′ north, about 50 miles below Dawson, Yukon Territory, and approximately the same distance above the town of Eagle, Alaska. It has a drainage area of 6,350 square miles, about 4 per cent of which lies in Canadian territory. The basin is roughly symmetrical and the extreme north-south and east-west dimensions are each about 100 miles. The stream flow is predominantly from west to east. The main Fortymile River is formed by the North and South forks, which unite about 40 miles in an air line from the Yukon. 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 feature. From the west Goodpaster, Volkmar, and Healy rivers take the adjoining drainage from mountains equally rugged. In the southeast portion the streams head in a country of relatively low relief and 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.

Near the international boundary the river flows through a narrow rock canyon from which it emerges into an open valley and takes a more moderate grade to its union with the Yukon. A prominent feature of the lower Fortymile is the well-defined bench which marks the elevation of an earlier valley floor. At Steele Creek the bench is about 500 feet above the water level. The plane of the present valley floor and that of the older one become coincident near the mouth of Kechumstuk Creek at an elevation of about 2,000 feet above sea level.

The principal tributaries below the forks are Steele, Canyon, Smith, and Moose creeks from the south and O'Brien Creek from the north.

[1] So called because its confluence with Yukon River is 40 miles below the old trading post of Fort Reliance.

Daily discharge, in second-feet, of Fortymile River at Steele Creek for 1910.[a]

[Drainage area, 5, 890 square miles.]

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	....	7,980	575	896	21	....	880	1,620	1,760
2	....	5,630	584	880	22	....	730	1,560	1,530
3	....	4,260	580	880	23	....	737	1,320	1,300
4	....	2,920	567	1,230	24	....	758	1,210	....
5	....	2,360	543	1,450	25	....	772	1,190	....
6	....	2,660	521	1,450	26	....	880	1,280	....
7	....	2,160	507	1,540	27	....	786	1,250	....
8	....	1,720	535	1,470	28	13,300	706	1,210	....
9	....	1,270	7,470	1,270	29	13,900	682	1,180	....
10	....	2,240	7,240	1,150	30	11,000	630	1,180	....
11	....	2,130	4,900	1,130	31	....	580	1,020	....
12	....	2,060	3,590	1,130	Mean	12,700	1,870	1,780	1,600
13	....	2,090	2,660	1,080	Mean per square mile	2.16	0.317	0.302	0.272
14	....	2,280	2,130	1,030	Run-off (depth in inches on drainage area)	0.24	0.36	0.35	0.23
15	....	1,790	1,670	1,050					
16	....	1,660	1,360	2,720					
17	....	1,500	1,280	3,080					
18	....	1,210	1,490	3,440					
19	....	1,030	1,450	2,890					
20	....	952	1,450	2,440					

[a] The rating curve for this station is fairly well defined for all stages.

Daily discharge, in second-feet, of Steele, Canyon, and Squaw creeks for 1910.

Day.	Steele Creek at mouth [a] (drainage area, 12.5 square miles).				Canyon Creek below Squaw Gulch [a] (drainage area, 58.4 square miles).			Squaw Gulch at claim "No. 1 above" [b] (drainage area, 24.4 square miles).		
	June.	July.	Aug.	Sept.	July.	Aug.	Sept.	July.	Aug.	Sept.
1	......	4.6	0.4	3.0	......	9.6	18.0	......	1.2	5.9
2	......	3.2	.3	3.0	11.7	6.8	18.0	......	1.0	5.9
3	......	2.1	.3	3.0	10.3	6.8	18.0	3.8	1.2	8.9
4	......	1.5	.2	3.0	10.3	6.8	39	4.5	1.0	6.9
5	......	1.4	.1	3.4	12.6	6.8	39	3.8	1.0	5.9
6	......	2.8	.1	10.5	34	5.7	15.0	10.5	.8	10.5
7	......	2.1	.2	8.0	72	6.8	15.0	8.9	.8	11.8
8	......	1.7	5.6	5.6	12.6	72	39	5.9	27	10.5
9	......	1.1	254	5.0	12.6	348	39	4.5	143	10.5
10	......	.9	26	5.0	12.6	288	50	3.8	43	14.8
11	......	.9	10.5	4.0	12.6	181	57	5.9	27	16.8
12	......	.8	6.2	4.0	34	137	72	7.8	10.5	21
13	......	5.6	4.2	4.0	97	116	72	70	7.8	27
14	......	5.0	3.0	4.0	72	80	72	52	5.9	52
15	......	3.0	2.2	4.0	51	72	80	31	75	66
16	......	2.1	4.0	8.0	29	62	88	15.0	27	79
17	......	1.5	4.0	14.6	15.0	50	88	8.9	6.9	60
18	......	1.2	4.6	12.5	18.0	39	97	5.9	10.5	27
19	......	1.0	5.0	10.5	12.6	12.6	116	3.8	13.4	32
20	......	.9	4.0	8.0	8.6	18.0	......	3.1	8.9	30
21	......	.8	3.4	6.5	12.6	15.0	......	3.1	5.9	29
22	......	.8	2.7	......	15.0	18.0	......	2.6	3.1	28
23	......	.8	2.6	......	18.0	25	......	2.6	5.9	27
24	......	.7	2.8	......	10.3	29	......	2.2	8.9	27
25	......	.6	3.4	......	10.3	34	......	2.2	11.8	27
26	......	.5	8.0	......	10.3	39	......	1.8	11.8	13.4
27	......	.4	5.0	......	12.6	44	......	1.5	10.5	10.5
28	36	.4	6.5	......	8.6	15.0	......	1.2	10.5	10.5
29	16.2	.4	5.0	......	6.8	8.6	......	1.0	4.5	......
30	8.0	.3	3.4	......	8.6	12.6	......	1.0	6.9	......
31	......	.2	3.0	......	8.6	18.0	......	1.0	5.9	......
Mean	20.1	1.59	12.3	6.17	22.0	57.5	54.3	9.29	16.1	24.1
Mean per square mile	1.61	0.127	0.984	0.494	0.377	0.984	0.930	0.381	0.660	0.988
Run-off (depth in inches on drainage area)	0.18	0.15	1.13	0.38	0.42	1.13	0.66	0.41	0.76	1.03

[a] The discharges for these stations are well defined below 40 second-feet.
[b] The discharges for this station are fairly well defined below 15 second-feet.

Miscellaneous measurements in Fortymile River drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
June 27	King Solomon Creek at mouth	54.2	17.3	0.32
July 30	....do	54.2	5.7	.11
June 27	Liberty Creek at mouth	43.1	19.4	.45
July 30	....do	43.1	4.9	.11
June 28	Dome Creek at trail crossing	24.9	14.8	.59

SOUTH FORK OF FORTYMILE RIVER DRAINAGE BASIN.

The South Fork is formed by the junction of Dennison and Mosquito forks, which unite about 25 miles above its mouth. Below the forks the river flows due east for about 4 miles to a point just below the mouth of Atwater Creek, where it makes a right-angle turn and flows northward to its confluence with the North Fork.

The principal tributaries from the west in sequence upstream are Butte, Buckskin, and Franklin creeks, and from the east Uhler and Napoleon creeks, Walker Fork, and Atwater Creek are the main drainage channels.

Walker Fork, which is the largest tributary of the South Fork, joins the main stream about 16 miles from its mouth, a short distance above Napoleon Creek. It rises in Canadian territory about 2 miles beyond the boundary, flows westward for about 35 miles, and drains a total area of 414 square miles. Its principal tributaries from the north are Wade, Twelvemile, Davis, and Poker creeks. From the south, Liberty Fork and Cherry Creek are the most important affluents.

Mosquito Fork, the left branch of the South Fork, heads at an elevation of 3,000 to 4,000 feet in a ridge paralleling Tanana River and about 20 miles from that stream. The general direction of flow is northeast for about 75 miles, and the drainage area comprises 1,120 square miles. Chicken Creek is the first tributary from the north, and although of small drainage area it is economically important as a gold producer. Gold Creek joins from the north about 12 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.

Dennison Fork has its source in a country similar to that of Mosquito Fork, and the ridge separating its drainage from that of Tanana River parallels the Tanana at a distance varying from 4 to 10 miles. The flat basin at the head is not so pronounced as that of Mosquito Fork, but the valleys are broad and swampy, with very gentle slopes. The drainage area is 1,540 square miles, about equally divided between two forks which unite to form the main stream about 12 miles above its mouth.

Daily discharge, in second-feet, of South Fork, Mosquito Fork, and Kechumstuk Creek for 1910.[a]

Day.	South Fork of Fortymile River at Franklin Creek (drainage area, 3,180 square miles).			Mosquito Fork below Kechumstuk Creek (drainage area, 824 square miles).				Kechumstuk Creek at mouth (drainage area, 189 square miles).			
	July.	Aug.	Sept.	July.	Aug.	Sept.	Oct.	July.	Aug.	Sept.	Oct.
1	......	179	420	......	52	65	49	......	13.0	14.8	14.8
2	......	179	420	......	49	63	41	......	13.0	14.8	13.0
3	......	166	468	......	47	58	37	......	12.7	13.9	11.8
4	......	153	468	......	43	56	......	......	12.4	13.5	......
5	......	153	420	......	43	56	......	......	11.8	15.8	......
6	......	134	420	......	41	58	......	......	11.1	17.1	......
7	......	134	420	325	40	58	......	80	10.5	17.6	......
8	......	179	420	286	45	56	......	69	12.7	17.6	......
9	735	5,120	420	227	234	56	......	52	178	16.7	......
10	683	4,060	420	202	193	56	......	42	132	16.7	......
11	631	2,530	420	175	179	56	......	39	87	15.8	......
12	540	1,900	420	175	186	53	......	32	49	15.8	......
13	709	1,420	420	197	149	52	......	97	39	14.8	......
14	870	968	468	193	130	53	......	92	32	15.8	......
15	842	787	468	197	102	58	......	65	24	18.3	......
16	870	709	516	238	89	65	......	49	21	25	......
17	912	761	516	193	83	72	......	39	24	30	......
18	870	842	631	162	80	77	......	32	24	33	......
19	420	842	631	140	74	80	......	26	22	32	......
20	372	709	631	119	77	74	......	24	24	25	......
21	324	631	631	104	79	66	......	22	24	22	......
22	324	631	566	99	109	62	......	24	22	16.7	......
23	324	631	566	94	106	50	......	24	17.6	16.7	......
24	324	631	516	86	95	53	......	24	17.1	16.7	......
25	324	631	516	83	94	53	......	22	17.1	16.7	......
26	282	566	516	83	86	49	......	19.1	16.7	15.8	......
27	237	566	516	83	80	47	......	17.1	15.8	14.8	......
28	237	566	468	80	74	46	......	15.8	14.8	14.8	......
29	237	516	468	70	69	38	......	14.8	15.8	11.8	......
30	237	468	420	63	66	37	......	13.9	14.8	12.4	......
31	237	468	......	57	63	......	......	13.0	14.8	......	......
Mean	502	911	487	149	92.2	57.4	42.3	37.9	30.4	18.1	13.2
Mean per square mile	0.158	0.286	0.153	0.181	0.111	0.070	0.051	0.201	0.161	0.096	0.070
Run-off (depth in inches on drainage area)	0.13	0.33	0.17	0.17	0.13	0.08	0.006	0.19	0.18	0.11	0.008

[a] The discharges at these stations are fairly well defined for all stages.

Daily discharge, in second-feet, of Walker Fork, Wade Creek, and Forty-five Pup for 1910.

Day.	Walker Fork above Twelvemile Creek [a] (drainage area, 70.2 square miles).		Wade Creek at claim "No. 10 above" [b] (drainage area, 23.1 square miles).			Forty-five Pup at claim No. 13 [c] (drainage area, 9.1 square miles).		
	July.	Aug.	July.	Aug.	Sept.	July.	Aug.	Sept.
1	....	30	....	2.0	11.0	....	0.7	1.7
2	....	15.0	....	1.1	13.4	....	.6	2.3
3	33	11.3	....	1.1	13.4	....	.6	2.3
4	30	11.3	2.1	1.1	13.4	....	.6	1.7
5	27	10.0	5.5	1.7	12.2	....	.6	1.3
6	51	8.7	8.8	1.1	16.4	....	.6	1.3
7	37	10	7.4	1.7	13.4	....	.6	1.3
8	26	54	6.0	31	11.0	....	13.2	1.3
9	23	242	4.5	125	11.0	....	63	1.3
10	26	114	3.0	90	13.4	....	16.6	1.3
11	30	61	6.5	11.0	13.4	1.4	9.1	1.3
12	26	41	10.0	16.4	12.2	2.2	5.4	1.3
13	46	33	13.0	11.0	11.0	3.1	4.5	....
14	33	26	16.4	12.2	16.4	2.4	3.7	....
15	41	20	5.0	8.8	16.4	1.9	2.9	....
16	26	25	10.0	27	13.4	1.4	3.7	....
17	23	30	7.5	23	19.5	1.9	2.9	....
18	23	30	9.0	19.5	16.4	1.4	2.3	....
19	26	26	5.2	19.5	16.4	1.0	2.3	....
20	15.0	26	1.5	13.4	13.4	.7	2.3	....
21	20	26	4.0	13.4	11.0	.8	2.3	....
22	30	26	6.5	16.4	11.0	2.3	1.7	....
23	33	30	9.0	8.8	13.4	1.7	1.3	....
24	37	30	7.0	13.4	11.0	1.3	1.7	....
25	26	26	5.2	40	8.8	1.0	1.7	....
26	20	26	3.5	23	16.4	.8	1.3	....
27	15.0	....	1.7	27	13.4	.8	2.3	....
28	13.2	....	2.5	23	13.4	.7	1.7	....
29	26	....	3.2	13.4	8.8	.7	1.3	....
30	30	....	4.0	13.4	8.8	.6	1.3	....
31	30	....	3.0	11.0	....	.6	1.7	....
Mean	28.4	38.0	6.11	20.0	13.1	1.37	4.98	1.53
Mean per square mile	0.405	0.541	0.264	0.866	0.567	0.151	0.547	0.168
Run-off (depth in inches on drainage area)	0.44	0.52	0.27	1.00	0.63	0.12	0.63	0.07

[a] The rating curve for this station is fairly well defined below 50 second-feet discharge; above that point it is only approximate.

[b] Discharges at this station from July 7 to 13 and 14 to 26 and July 28 to Aug. 1 were determined from comparative hydrographs and are only approximate. The rating curve is fairly well defined below 25 second-feet discharge.

[c] The discharges given for this station below 20 second-feet are probably correct within 10 per cent.

Daily discharge, in second-feet, of Buckskin Creek above Forty-five Pup for 1910.

[Drainage area, 33 square miles.]

July 11	4.3	Sept. 1	5.3
July 13	4.8	Sept. 4	4.3
July 14	4.3	Sept. 5	3.9
Aug. 4	3.3	Sept. 13	3.9
Aug. 5	2.9		
Aug. 11	12.4	Mean	4.88
Aug. 21	4.3		

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

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
Aug. 7	Gold Creek above Willow Creek	57.7	2.0	0.03
Aug. 12	Gold Creek 1 mile above mouth	112	21	.19
July 2	Walker Fork above Poker Creek	7.4	5.7	.77
Do	Poker Creek one-half mile above mouth	3.1	1.3	.42
Do	Davis Creek 1 mile above mouth	1.5	1.5	1.00
July 5	Napoleon Creek at mouth	13.3	1.1	.08

NORTH FORK OF FORTYMILE RIVER DRAINAGE BASIN.

The North Fork drains a large area north and west of the main stream, rising in irregular ridges to heights of 3,000 to 6,000 feet. 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 already mentioned in connection with Fortymile River. The drainage area is 2,120 square miles.

The principal tributaries from head to mouth are Comet and Champion creeks from the east, and Slate Creek, Middle Fork, Bullion and Hutchinson creeks from the west. The drainage area of the Middle Fork is 1,110 square miles, which is 52 per cent of the total drainage of the North Fork. Its headwaters drain a flat basin-like country smaller than but similar to that of Mosquito and Dennison forks.

About 3 miles below the mouth of Hutchinson Creek the river originally followed a large meander locally known as the "kink." Although the distance around was $2\frac{3}{4}$ miles, the two channels at the neck of the meander were separated by a sharp rock ridge only about 100 feet high and about the same distance in width 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 purposes. A fall of about 17 feet is now concentrated in a horizontal distance of only a little over 100 feet, which gives possibilities for development of considerable water power. (See horsepower table, p. 180.)

Daily discharge, in second-feet, of North Fork and Hutchinson and Montana creeks for 1910.

Day.	North Fork of Fortymile River above Middle Fork *a* (drainage area, 724 square miles).				North Fork of Fortymile River at "kink" *b* (drainage area, 2,010 square miles).			Hutchinson Creek below Montana Creek *c* (drainage area, 29.0 square miles).		Montana Creek at claim No. 7 (drainage area, 5.9 square miles).		
	July.	Aug.	Sept.	Oct.	July.	Aug.	Sept.	July.	Aug.	July.	Aug.	Sept.
1		162	135	189		293	352		4.5		0.5	1.1
2		162	204	162		300	340		4.1		.5	1.1
3		149	739			306	305		4.1		.5	1.1
4		135	610			306	564		4.1		.5	1.1
5		125	516			289	762		3.7		.5	1.5
6		106	610			286	762		3.7		.5	1.5
7		99	516			276	829		3.7		.5	1.5
8		189	516			263	777		73		19.4	1.5
9		1,430	464		396	1,740	629		88		25	1.2
10		923	377		1,150	2,350	540		78		7.0	1.2
11		610	377		1,110	1,750	525		69		4.3	1.2
12		464	330		1,120	1,250	525		51		3.6	1.1
13		330	330		1,020	918	488		51		2.8	1.1
14		256	292		1,040	858	416	10.5	51	1.2	2.4	1.1
15	256	219	665		702	653	431	8.6	51	1.1	2.1	1.1
16	230	204	1,210		585	482	1,630	6.7	51	1.1	2 2	1.1
17	189	219	981		435	384	1,890	6.1	44	.8	2.2	1.1
18	162	204	1,210		*d*443	480	2,080	5.4	37	.8	2.2	1.1
19	189	219	872		451	450	1,670	5.0	30	.7	2.2	1.1
20	189	219	665		429	548	1,340	4.8	23	.5	2.2	2.6
21	162	204	464		411	732	836	6.7	16	.5	2.2	2.2
22	162	189	419		300	687	713	6.7	8.2	.5	1.5	2.2
23	219	162	374		306	510	543	7.0	9.2	.5	1.5	
24	204	155	330		321	428		6.1	10.2	.7	1.5	
25	219	162	256		332	414		4.8	11.2	.5	1.2	
26	162	155	256		442	528		4.5	12.2	.5	1.2	
27	149	162	219		406	506		4.5	13.2	.5	1.2	
28	149	189	189		347	477		4.5	14.2	.5	1.2	
29	125	182	162		329	491		4.5	15.2	.5	1.1	
30	116	162	189		291	527		4.7		.5	1.1	
31	135	135			254	408		4.8		.5	1.1	
Mean	177	267	483	176	549	642	824	5.88	28.8	0.661	3.09	1.35
Mean per square mile	0.244	0.369	0.667	0.243	0.273	0.319	0.410	0.203	0.993	0.112	0.524	0.229
Run-off (depth in inches on drainage area)	0.15	0.42	0.74	0.02	0.23	0.37	0.35	0.14	1.07	0.07	0.60	0.19

a The rating curve for this station is well defined below 400 second-feet discharge.
b Drainage area of the North Fork at the "kink" is 74 per cent of that of the Fortymile at Steele Creek minus that of the South Fork at Franklin Creek. Daily discharges at the "kink" were obtained by taking 74 percent of the difference in discharge between the Fortymile at Steele Creek and the South Fork at Franklin Creek.
c The discharges at this station for Aug. 13-15, 17-21, and 23-28 were determined by comparative hydrographs and interpolation.
d Mean of the 17th and 19th.

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

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
July 18	North Fork of Fortymile River above Slate Creek.	109	16.8	0.15
July 15	North Fork of Fortymile River at "kink"	2,010	897	.45
Aug. 8	do	2,010	425	.21
July 18	Slate Creek at mouth	336	40	.12
Aug. 26	Champion Creek below Arkansas Creek	43.4	8.8	.20
Sept. 11	do	43.4	13.8	.32
Aug. 25	Champion Creek above Bear Creek	125	14.1	.11
July 17	Champion Creek at mouth	179	78	.44
Aug. 25	Bear Creek at mouth	48.0	9.0	.19
July 16	Middle Fork of Fortymile River at mouth	1,110	397	.36
Aug. 22	Bullion Creek at mouth	34.3	14.6	.43
July 13	Hutchinson Creek below Confederate Creek	16.6	7.3	.44
July 14	do	16.6	5.8	.35
Aug. 7	do	16.6	1.7	.10
Aug. 9	do	16.6	35	2.11
Aug. 21	do	16.6	3.9	.23

EAGLE DISTRICT.

LOCATION OF AREA.

The Eagle district in this report is considered as the area drained by Mission Creek and its tributaries. It lies in the Eagle precinct and the town of Eagle is the center of commercial activity. It was topographically surveyed in 1898 and is covered by the map of the Fortymile quadrangle.

GAGING STATIONS AND MEASURING POINTS.

The following list gives the locations at which gaging stations were maintained or discharge measurements made in 1910 in the Eagle district:

Gaging stations and measuring points in Eagle district, 1910.

Mission Creek drainage basin:
- Mission Creek above Colorado Creek.
- Mission Creek above American Creek.
- Excelsior Creek at mouth.
- American Creek at claim "No. 8 above."
- American Creek at United States pumping plant.
- Discovery Fork of American Creek below Star Gulch.

MISSION CREEK DRAINAGE BASIN.

Mission Creek drains a circular-shaped area of 170 square miles lying between Fortymile and Seventymile rivers. It enters the Yukon at the town of Eagle and has a length of about 30 miles. It flows generally northeastward to Excelsior Creek, where it makes a sharp turn and takes a southeastward course for 8 miles to its mouth. Its most southern waters rise at an elevation of about 4,000 feet in the divide at the head of O'Brien Creek, and its two largest tributaries from the west, Seward and Excelsior creeks, drain a portion of the eastern slope of Glacier Mountain, which reaches an elevation of 6,000 feet. Above Excelsior Creek the valley is bordered by high, precipitous slopes on either side. Below the big bend to the east the stream channel follows closely the northern part of the valley, which has a steep and narrow drainage slope to the north, whereas on the south the slope to the summit of the divide is very gradual.

American Creek is the largest tributary of Mission Creek and joins it from the south about a mile from the Yukon. It flows northeastward and is about 18 miles in length. Discovery Fork is its chief branch and enters American Creek about 8 miles from the head. Above Marion Creek, which is a small feeder from the east, the valley is sharply V-shaped and in some portions is almost canyon-like, being inclosed on either side by barren rocky slopes. Below Marion Creek the valley gradually broadens until it finally loses its identity in the Mission Creek Flats. The average grade through that portion in which mining has been carried on is about 125 feet to the mile. The total fall from the head to the mouth is about 2,000 feet.

Wolf Creek is tributary from the south about halfway between American and Excelsior creeks.

Spruce is the prevailing timber. An abundant supply is available for fuel, and in the Mission Creek valley considerable quantities of a size suitable for saw logs are to be found.

Daily discharge, in second-feet, of Mission Creek and Discovery Fork of American Creek for 1910.

Day.	Mission Creek above Colorado Creek[a] (drainage area, 84.81 square miles).			Discovery Fork of American Creek below Star Gulch[b] (drainage area, 14.8 square miles).			
	June.	July.	Aug.	June.	July.	Aug.	Sept.
1	......	239	70	......	2.7	1.0	2.7
2	......	93	56	......	1.5	1.0	36
3	......	70	48	......	1.2	2.0	24
4	......	70	42	......	1.2	3.0	12.4
5	......	251	42	......	1.2	6.0	12.4
6	......	70	38	......	1.2	10.0	10.4
7	......	56	......	......	.9	14.6	8.4
8	......	48	......	......	.9	44	6.3
9	......	48	......	......	.9	12.4	10.2
10	......	42	......	......	.8	10.0	8.4
11	......	42	......	......	2.7	8.0	8.4
12	......	93	......	......	73	6.0	6.3
13	......	84	......	......	24	4.0	8.0
14	......	56	......	......	10.2	3.8	12.4
15	......	42	......	......	2.7	3.2	12.4
16	......	48	......	......	2.7	3.8	14.6
17	......	48	......	......	1.5	3.8	21
18	......	42	......	......	1.5	4.3	12.4
19	......	42	......	......	2.7	4.2	11.2
20	......	42	......	......	1.5	4.2	10.2
21	......	48	......	......	1.5	4.1	9.0
22	......	62	......	......	1.5	4.1	7.5
23	......	56	......	......	1.5	4.0	6.3
24	......	48	......	......	1.5	4.0	6.3
25	111	42	......	......	1.5	3.9	6.7
26	102	42	......	......	1.5	3.8	7.1
27	102	42	......	2.7	1.5	3.2	......
28	124	38	......	10.2	.8	3.2	......
29	144	38	......	40	.8	3.0	......
30	124	35	......	10.2	.8	3.0	......
31	......	84	......	......	.8	2.8	......
Mean	118	66.5	49.3	15.8	4.80	6.08	11.2
Mean per square mile	1.39	0.784	0.581	1.07	0.324	0.411	0.757
Run-off (depth in inches on drainage area)	0.31	0.90	0.13	0.16	0.37	0.47	0.73

[a] The discharges at this station are fairly well defined between 50 and 110 second-feet.
[b] The rating curve for this station is well defined below 25 second-feet. A considerable part of the discharges during August were determined by comparative hydrographs, but the figures given are probably correct within 10 per cent.

Daily discharge, in second-feet, of American Creek for 1910.

Day.	American Creek at claim "No. 8 above" (drainage area, 24.1 square miles).				American Creek at United States pumping plant (drainage area, 67.3 square miles).				
	June.	July.	Aug.	Sept.	June.	July.	Aug.	Sept.	Oct.
1	......	19.4	8.0	7.7	......	24	22	22	36
2	......	12.6	7.7	36	......	45	22	57	36
3	......	12.6	7.4	25	......	34	22	146	22
4	......	10.4	7.1	14.6	......	24	15.0	87	22
5	......	*a* 145	6.8	12.6	......	75	11.2	57	22
6	......	36	6.5	11.4	......	45	13.1	57	22
7	......	17.0	6.2	10.1	......	24	13.1	50	22
8	......	12.6	31	8.9	......	22	30	42	22
9	......	10.4	36	13.0	......	22	*a* 541	42	30
10	......	8.9	*a* 84	19.4	......	15.0	87	50	22
11	......	14.6	71	14.6	......	15.0	75	50	22
12	......	17.0	54	8.9	......	30	57	42	22
13	......	10.4	17.0	11.6	......	42	50	42	22
14	......	8.9	12.6	14.6	45	42	50	50	......
15	......	7.7	8.9	42	42	42	26	165	......
16	......	7.7	8.9	44	50	32	30	114	......
17	......	7.7	8.9	44	[1]779	22	30	99	......
18	......	7.7	8.9	30	208	42	30	122	......
19	......	8.9	8.9	17.0	99	42	26	87	......
20	......	7.7	8.9	17.0	75	22	42	50	......
21	......	7.7	8.9	17.0	57	22	32	42	......
22	......	7.7	8.9	......	42	22	36	42	......
23	......	7.7	8.9	......	42	42	36	42	......
24	......	7.7	8.9	......	34	30	26	42	......
25	......	7.7	8.9	......	30	22	26	42	......
26	12.6	7.2	8.9	......	24	30	30	42	......
27	12.6	6.7	8.9	......	24	15.0	30	42	......
28	12.6	6.2	6.9	......	22	15.0	30	30	......
29	10.4	5.7	4.9	......	26	15.0	26	30	......
30	54	5.7	4.5	......	30	15.0	22	36	......
31		8.3	4.2	......		15.0	22	......	......
Mean	20.4	14.9	15.9	20.0	95.8	29.2	48.7	60.7	24.8
Mean per square mile	0.846	0.618	0.660	0.830	1.42	0.434	0.724	0.902	0.368
Run-off (depth in inches on drainage area)	0.16	0.71	0.76	0.65	0.90	0.50	0.83	1.01	0.18

a These discharges are only approximate.

Miscellaneous measurements in Mission Creek drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Second-feet.*	*Second-feet.*
June 13	Mission Creek above American Creek	168	225	1.34
June 23	Excelsior Creek at mouth	31.1	33	1.06
Aug. 29	.....do	31.1	23	.74
Sept. 8	.....do	31.1	43	1.38
Aug. 29	Wolf Creek at road crossing	28.4	12.0	.42
Sept. 8	.....do	28.4	20	.70

SEVENTYMILE DISTRICT.

LOCATION OF AREA.

The Seventymile district includes the area drained by Seventymile River and that lying to the north of the Seventymile and south of the Yukon. This district lies entirely within the Eagle precinct, and Eagle is the supply point for the mines. The maps showing the area are those of the Fortymile and Circle quadrangles.

GAGING STATIONS AND MEASURING POINTS.

The following list gives the locations at which gaging stations were maintained or discharge measurements made in 1910 in the Seventymile district:

Gaging stations and measuring points in Seventymile district, 1910.

- Seventymile River drainage basin:
  - Seventymile River above Flume Creek.
  - Seventymile River at the falls.
  - Flume Creek one-fourth mile above mouth.
  - Flume Creek ditch near outlet.
  - Alder Creek at claim "No. 7 above."
  - Deep Creek at mouth.
  - Nugget Creek at mouth.
  - Granite Creek above forks.
  - Granite Creek below forks.
  - Barney Creek at ditch intake.
  - Barney Creek at mouth.
  - Sonickson Creek at ditch intake.
  - Sonickson Creek ditch at outlet.
  - Mogul Creek at mouth.
  - Crooked Creek below Eldorado Creek.
  - Bryant Creek 2 miles above mouth.
- Washington Creek drainage basin:
  - Washington Creek below forks.

SEVENTYMILE RIVER DRAINAGE BASIN.

Seventymile River has its source in a relatively high and rugged divide east of Charley River. It flows east for about 60 miles to a point 4 miles from its mouth, where it makes a right-angle turn and flows north, joining Yukon River about 20 miles below Eagle. The drainage area is 667 square miles and is extremely unsymmetrical with respect to the river valley, as over three-fourths of it lies to the south.

The principal tributaries from the south, beginning with the headwaters, are Diamond Fork, Flume, Alder, Granite, Green, Sonickson, Mogul, and Bryant creeks. From the north Barney, Washington, and Crooked creeks are the principal streams, although much smaller than those from the south.

Extensive bench formations occur throughout the Seventymile Valley. Above the falls, which are located about one-half mile below Washington Creek, the river flows through a rather broad gravelly flood plain, but below the falls it is more closely confined and along a considerable part of its course has cut a rock canyon 20 to 30 feet deep. At the falls the river has a drop of about 9 feet in a horizontal distance of less than 200 feet. From Diamond Fork to the mouth, a distance of 53 miles following the general trend of the valley, the river has a fall of over 2,000 feet. From Diamond Fork to Barney Creek the river falls 1,400 feet in 25 miles and from Flume Creek to Barney Creek there is a drop of 600 feet in 15 miles.

Daily discharge, in second-feet, of Seventymile River for 1910.

Day.	Seventymile River above Flume Creek (drainage area, 129 square miles).[a]					Seventymile River at the falls (drainage area, 465 square miles).[b]			
	June.	July.	Aug.	Sept.	Oct.	June.	July.	Aug.	Sept.
1	......	108	518	108	70	......	322	602	275
2	......	137	272	412	68	......	400	548	760
3	......	102	152	325	......	......	258	360	1,020
4	......	100	124	298	......	......	380	290	938
5	......	278	108	314	......	......	520	270	830
6	......	124	89	257	......	......	322	225	865
7	......	96	2,280	247	......	......	465	208	830
8	......	74	1,390	186	......	......	208	4,300	575
9	......	60	481	179	......	......	210	4,430	575
10	......	108	446	205	......	......	300	1,550	695
11	......	555	288	179	......	......	650	865	575
12	......	674	205	146	......	......	1,100	586	520
13	......	383	168	146	......	......	1,350	975	465
14	......	186	186	239	......	......	380	680	619
15	......	137	152	503	......	......	305	380	1,600
16	......	117	168	402	......	662	340	434	1,230
17	......	100	168	325	......	2,120	262	420	1,060
18	......	137	247	247	......	2,250	290	492	865
19	278	205	272	186	......	938	420	630	662
20	341	112	186	137	......	1,020	290	465	520
21	267	92	137	132	......	695	262	400	440
22	247	122	112	128	......	760	380	340	360
23	288	104	102	124	......	830	305	275	360
24	183	124	98	122	......	575	305	275	368
25	183	102	92	102	......	400	290	262	380
26	162	100	108	92	......	400	262	270	360
27	122	76	112	84	......	340	222	360	360
28	159	74	124	70	......	830	208	456	230
29	156	76	104	82	......	520	250	340	225
30	112	76	106	70	......	420	223	305	225
31	......	518	92	......	......	......	975	281	......
Mean	208	170	293	202	69	851	402	719	626
Mean per square mile	1.61	1.32	2.27	1.57	0.535	1.83	0.865	1.55	1.35
Run-off (depth in inches on drainage area)	0.72	1.52	2.62	1.75	0.04	1.02	1.00	1.79	1.51

[a] Discharges at this station above 400 second-feet are only approximate.
[b] Discharges at this station above 1,500 second-feet are only approximate.

Daily discharge, in second-feet, of Flume and Alder creeks for 1910.

Day.	Flume Creek ¼ mile above mouth (drainage area, 36.7 square miles).[a]				Alder Creek at claim "No. 7 above" (drainage area, 11.8 square miles).[b]				
	June.	July.	Aug.	Sept.	June.	July.	Aug.	Sept.	Oct.
1	......	22	86	21	......	9.8	15.2	8.2	7.7
2	......	26	50	40	......	9.8	11.5	14.0	7.1
3	......	19.6	34	66	......	9.2	10.6	24	7.7
4	......	17.9	27	63	......	15.2	9.2	25	7.3
5	......	38	23	61	......	12.9	9.2	31	6.7
6	......	28	18.7	56	......	10.6	8.2	29	......
7	......	22	16.4	44	......	9.8	8.2	18.5	......
8	......	16.5	192	39	......	9.2	45	15.2	......
9	......	17.3	181	35	......	9.2	70	11.5	......
10	......	13.9	106	42	......	8.8	56	17.0	......
11	......	14.3	63	42	......	9.8	33	12.9	......
12	......	113	54	32	......	9.8	18.5	12.1	......
13	......	26	42	30	......	9.8	12.9	11.5	......
14	......	15.8	36	37	......	9.2	10.6	14.0	......
15	......	20	37	97	......	9.2	10.6	56	......
16	......	42	39	83	......	9.2	10.6	42	......
17	......	30	37	67	......	8.8	10.6	27	......
18	......	49	37	55	......	12.1	10.6	20	......
19	67	56	42	45	......	12.9	9.8	12.9	......
20	86	37	35	38	24	9.8	9.2	9.2	......
21	65	28	26	34	12.9	11.5	9.2	10.6	......
22	69	28	19.4	31	14.0	10.6	9.2	8.2	......
23	68	22	18.5	28	12.9	9.8	8.8	7.3	......
24	47	18.9	16.7	25	11.5	9.8	8.2	7.3	......
25	26	18.5	15.6	23	11.5	9.8	8.2	7.3	......
26	34	16.9	17.1	23	10.6	9.8	8.2	7.3	......
27	28	15.5	18.6	22	10.6	8.8	8.2	7.3	......
28	53	14.3	17.0	......	12.1	9.2	9.8	7.9	......
29	40	16.9	17.1	......	9.8	8.2	9.2	8.5	......
30	28	19.4	24	......	9.2	8.8	9.2	9.2	......
31	......	115	21	......	......	32	8.2	......	......
Mean	50.9	30.2	44.1	43.7	12.6	10.8	15.4	16.4	7.3
Mean per square mile	1.39	0.823	1.20	1.19	1.07	0.915	1.31	1.39	0.619
Run-off (depth in inches on drainage area)	0.62	0.95	1.38	1.19	0.44	1.05	1.51	1.55	0.12

[a] The rating curve for this station is well defined below 100 second-feet discharge previous to Aug. 7; after that date it may be slightly in error, due to shifting channel conditions.
[b] The discharges given at this station are probably correct within 10 per cent for all those below 40 second-feet.

Daily discharge, in second-feet, of Barney, Sonickson, and Crooked creeks for 1910.

Day.	Barney Creek above ditch intake.[a]				Sonickson Creek above ditch intake (drainage area, 12.6 square miles).[b]				Crooked Creek below Eldorado Creek (drainage area, 17.2 square miles).			
	June.	July.	Aug.	Sept.	June.	July.	Aug.	Sept.	June.	July.	Aug.	Sept.
1	......	0.6	0.8	1.1	......	4.0	6.2	10.2	......	4.4	1.9	4.4
2	......	.6	.7	4.1	......	3.7	5.8	30	......	3.4	1.9	16.0
3	......	.6	.6	7.1	......	3.3	5.4	51	......	2.6	1.4	29
4	......	.6	.5	6.7	......	3.0	5.0	42	......	3.4	1.4	22
5	......	2.8	.4	6.2	......	2.9	4.5	34	......	4.4	1.0	22
6	......	1.2	.4	5.7	......	2.8	4.0	30	......	3.4	1.0	20
7	......	1.0	1.0	5.2	......	2.7	5.5	26	......	2.6	1.0	14.0
8	......	.8	3.5	4.7	......	2.5	7.0	26	......	1.9	[c]139	8.4
9	......	.6	13.4	4.2	......	2.5	192	26	......	1.4	[c]119	12.0
10	......	.6	11.7	3.7	......	2.5	55	24	......	1.4	28	18.0
11	......	.6	3.7	......	......	3.2	34	21	......	1.9	18.0	16.0
12	......	.7	1.8	......	......	3.9	17.7	19	......	3.4	10.2	12.0
13	......	.8	1.8	......	......	4.6	13.0	17.7	......	2.6	7.0	12.0
14	......	.9	1.5	......	......	5.3	11.2	20	......	1.9	5.5	25
15	......	.8	1.2	......	......	5.0	10.7	26	3.4	1.9	5.5	46
16	......	.6	.9	......	8.8	4.5	10.2	32	5.5	1.4	7.0	28
17	......	.6	1.2	......	310	4.0	10.2	39	43	1.4	7.0	34
18	2.8	.6	1.5	......	61	4.6	10.6	......	28	1.9	12.0	25
19	2.0	.6	1.8	......	20	10.2	10.0	......	14.0	2.6	10.2	20
20	.9	.4	1.5	......	17.7	7.9	9.5	......	8.4	1.9	8.4	25
21	.9	.5	1.2	......	9.5	6.2	8.7	......	7.0	1.9	7.0	......
22	.6	.6	.9	......	9.5	12.8	7.9	......	4.4	4.4	5.5	......
23	.5	.6	.9	......	8.4	19.3	7.2	......	4.4	3.4	5.5	......
24	.4	.6	.9	......	6.2	13.9	8.4	......	3.5	4.4	5.5	......
25	.4	.6	.9	......	5.3	12.8	8.4	......	2.6	3.4	5.5	......
26	.5	.6	.9	......	4.9	6.2	8.4	......	2.6	2.6	5.5	......
27	.6	.6	.9	......	6.8	5.8	9.0	......	7.0	1.9	5.5	......
28	1.2	.6	.9	......	5.7	5.4	10.1	......	7.0	1.4	5.5	......
29	1.2	.7	.9	......	4.6	5.0	11.2	......	7.0	1.4	4.4	......
30	1.2	.8	.9	......	4.3	5.4	9.5	......	8.4	1.4	4.4	......
31	......	.9	.9	......	......	5.9	9.8	......	......	1.9	4.4	......
Mean	1.02	0.745	1.94	4.87	32.2	5.86	17.0	27.9	9.76	2.51	14.4	20.4
Mean per square mile	......	......	......	......	2.56	0.465	1.35	2.21	0.567	0.146	0.837	1.19
Run-off (depth in inches on drainage area)	......	......	......	......	1.43	0.536	1.56	1.40	0.34	0.17	0.96	0.88

[a] The discharges at this station are based on gage readings taken about every 4 days and are only approximate, owing to shifting channel conditions.
[b] The discharges at this station for July 9-13 and 25-28, Aug. 2-5, and several shorter periods are estimated from comparative hydrographs. The rating curve is well defined below 80 second-feet.
[c] Approximate.

Miscellaneous measurements in Seventymile River drainage basin in 1910.

Date.	Stream and locality.	Drainage area.	Discharge.	Discharge per square mile.
		Sq. miles.	*Sec.-ft.*	*Sec.-ft.*
June 20	Flume Creek ditch near outlet	....	2.6	....
July 20	....do	....	2.5	....
Sept. 5	....do	....	3.5	....
June 21	Deep Creek at mouth	4.8	3.1	0.65
Do	Nugget Creek at mouth	2.7	.47	.17
July 18	Granite Creek above forks	68.1	10.4	.15
Do	Granite Creek below forks	112	22	.20
June 18	Barney Creek at mouth	....	4.3	....
June 22	Sonickson Creek ditch at outlet	....	2.8	....
June 16	Mogul Creek at mouth	64.4	79	1.23
Aug. 30	....do	64.4	47	.73
June 15	Bryant Creek 2 miles above mouth	21.4	21	.98
Aug. 29	....do	21.4	27	1.26
Sept. 8	....do	21.4	19.2	.90

WASHINGTON CREEK DRAINAGE BASIN.

Washington Creek rises in the divide north of the Seventymile and flows northward for about 25 miles to its 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 at the west of Barney Creek, a measurement was made August 31 to determine the quantity of water on that day available for diversion over the divide to be used for hydraulicking on Pleasant Creek, which is 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.