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DEPARTMENT OF THE INTERIOR, CANADA
WATER POWER BRANCH
J. B. Challies, Supt.

WATER RESOURCES PAPER No. 1.

REPORT

ON

RAILWAY BELT HYDROGRAPHIC SURVEY
FOR 1911-12

BY

P. A. CARSON, D.L.S.
Chief Engineer

Prepared under the direction of the Superintendent of Water Power.

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY J. DE L. TACHE, PRINTER TO THE KING'S MOST
EXCELLENT MAJESTY.
1914

No. 25f—1914.]

To His Royal Highness, Field Marshal, Prince Arthur William Patrick Albert, Duke of Connaught and Strathearn, K.G., K.T., etc., etc., etc., Governor General and Commander-in-Chief of the Dominion of Canada.

MAY IT PLEASE YOUR ROYAL HIGHNESS:

The undersigned has the honour to lay before Your Excellency the report of the Hydrographic Survey of the Railway Belt, British Columbia for 1911-12.

Respectfully submitted,

W. J. ROCHE,
Minister of the Interior.

OTTAWA, February 23, 1914.

DEPARTMENT OF THE INTERIOR,

OTTAWA, Feb. 23, 1914.

The Honourable W. J. ROCHE,
Minister of the Interior.

SIR,—I have the honour to submit the report of the Hydrographic Survey of the Railway Belt, British Columbia, for 1911-12, and to recommend that it be published as Water Resources, Paper No. 1 of the Dominion Water Power Branch.

I have the honour to be, sir,
Your obedient servant,

W. W. CORY,
Deputy Minister of the Interior.

WATER POWER BRANCH,
DEPARTMENT OF THE INTERIOR,
OTTAWA, Feb. 23, 1914.

W. W. CORY, Esq., C.M.G.,
Deputy Minister of the Interior.

SIR,—I beg to submit herewith report of the Hydrographic Survey of the Railway Belt, British Columbia, for 1911-12, and would recommend that it be published as Water Resources, Paper No. 1 of the Dominion Water Power Branch, and that a sufficient number of copies be printed to permit of its being widely distributed among those interested in the question of the water supply of the province of British Columbia.

Respectfully submitted,

J. B. CHALLIES,
Superintendent, Dominion Water Power Branch.

HYDROGRAPHIC SURVEY, RAILWAY BELT, BRITISH COLUMBIA,
KAMLOOPS, Feb. 23, 1914.

SIR,—I have the honour to transmit herewith the manuscript of the report of Hydrographic Survey of the Railway Belt, British Columbia, for 1911-12. I beg to request that this manuscript be published as one of the Water Resources Papers of the Dominion Water Power Branch.

I have the honour to be, sir,
Your obedient servant,

P. A. CARSON,
Chief Engineer.

J. B. CHALLIES, Esq.,
Superintendent, Dominion Water Power Branch,
Department of the Interior,
Ottawa.

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PART I

THE RAILWAY BELT OF BRITISH COLUMBIA.

The Railway Belt of British Columbia is a strip of territory over 500 miles long and 40 miles wide, extending from the summit of the Rocky mountains (being the easterly boundary of the province) almost to the Pacific coast. The westerly limit of the Railway Belt is bounded by Mesliloet river, the North Arm of Burrard inlet, and the west boundaries of townships 39, 38, 2 and 1, west of Coast Meridian.

The Crown colony of British Columbia became part of the Confederation of the Dominion of Canada in 1871, under the provisions of section 146 of the British North America Act, 1867, which section provides for the admission into the union of other colonies. The date of admission was July 20, 1871, by an Imperial Order in Council, dated May 16, 1871.

Section 11 of the Terms of Union admitting British Columbia into Confederation is as follows:—

> "The Government of the Dominion undertake to secure the commencement, simultaneously, within two years from the date of the union, of the construction of a railway from the Pacific towards the Rocky mountains, and from such point as may be selected east of the Rocky mountains towards the Pacific, to connect the seaboard of British Columbia with the railway system of Canada; and, further, to secure the completion of such railway within ten years from the date of the Union.
>
> "And the Government of British Columbia agree to convey to the Dominion Government, in trust, to be appropriated in such manner as the Dominion Government may deem advisable in furtherance of the construction of the said railway, a similar extent of public lands along the line of railway throughout its entire length in British Columbia, not to exceed, however, twenty (20) miles on each side of said line, as may be appropriated for the same purpose by the Dominion Government, from the public lands in the Northwest Territories and the province of Manitoba. Provided that the quantity of land which may be held under pre-emption right or by Crown grant within the limits of the tract of land in British Columbia to be so conveyed to the Dominion Government, shall be made good to the Dominion from contiguous lands, and provided further, that until the commencement, within two years as aforesaid from the date of the union, of the construction of the said railway, the Government of British Columbia shall not sell or alienate any further portion of the public lands of British Columbia requiring actual residence of the pre-emptor on the land claimed by him. In consideration of the land to be so conveyed in aid of the construction of the said railway, the Dominion Government agree to pay to British Columbia, from the date of the union, the sum of 100,000 dollars per annum, in half-yearly payments in advance."

Although this conveyance was contemplated in 1871 by the aforesaid eleventh article of the Terms of Union, and a Provincial Act was passed in 1880 (13 Vict., chap. 11, assented to on May 8, 1880) looking to the transfer, the actual conveyance was not effected until the passing of a Provincial Act (assented to December 19, 1883), intituled "An Act relating to the Island Railway, the Graving Dock and Railway Lands of the Province" (47 Vict., chap. 14), and its confirmation by the Dominion by an Act assented to on April 19, 1884 (47 Vict., chap. 6).

Extracts of this Dominion Act, statutes of Canada, Fifth Parliament, are here given:—

"An Act respecting the Vancouver Island Railway, the Esquimalt Graving Dock, and certain Railway Lands of the Province of British Columbia, granted to the Dominion.

"Whereas negotiations between the Governments of Canada and British Columbia have been recently pending, relative to delays in the commencement and construction of the Canadian Pacific railway, and relative to the Vancouver Island railway, the Esquimalt Graving Dock, and certain railway lands of the province of British Columbia;

"And whereas, for the purpose of settling all existing disputes and difficulties between the two Governments, it hath been agreed as follows:—

"(a) The Legislature of British Columbia shall be invited to amend the Act number eleven, of 1880, intituled 'An Act to authorize the grant of certain public lands on the mainland of British Columbia to the Government of the Dominion of Canada for Canadian Pacific Railway purposes,' so that the same extent of land on each side of the line of railway through British Columbia, wherever finally settled, shall be granted to the Dominion Government in lieu of the lands conveyed by that Act:

"(c) The Government of British Columbia shall obtain the authority of the Legislature to convey to the Government of Canada three and one-half millions of acres of land in the Peace River district of British Columbia, in one rectangular block, east of the Rocky mountains and adjoining the North-West Territories of Canada.

"(h) The Government of Canada shall, with all convenient speed, offer for sale the lands within the Railway Belt upon the mainland, on liberal terms to actual settlers; and:—

"(i) Shall give persons who have squatted on any of the said lands, within the Railway Belt on the mainland, prior to the passing of the Act, and who have made substantial improvement the con, a prior right of purchasing the lands so improved at the rates charged to settlers generally;

"(k) This agreement is to be taken by the province in full of all claims up to this date by the province against the Dominion, in respect of delays in the commencement and construction of the Canadian Pacific railway, and in respect of the non-construction of the Esquimalt and Nanaimo railway, and shall be taken by the Dominion in satisfaction of all claims for additional lands under the terms of Union, but shall not be binding unless and until the same shall have been ratified by the Parliament of Canada and the Legislature of British Columbia;

"And whereas the Legislature of British Columbia has, by an Act assented to on the 19th day of December, 1883, intituled 'An Act relating to the Island Railway, the Graving Dock and Railway Lands of the Province,' adopted the terms of the said agreement, and it is expedient that it should be ratified by the Parliament of Canada, and that provision should be made to carry out the terms thereof according to their purport;

"Therefore, Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

"1. The hereinbefore recited agreement is hereby approved and ratified.

"XI. The lands granted to Her Majesty, represented by the Government of Canada, in pursuance of the eleventh section of the Terms of Union, by the Act of the Legislature of the Province of British Columbia, number eleven of 1880, intituled 'An Act to authorize the grant of certain public lands on the mainland of British Columbia to the Government of the Dominion of

Canada for Canadian Pacific Railway purposes, as amended by the Act of the said Legislature, assented to on the 19th day of December, 1883, as aforesaid, intituled 'An Act relating to the Island Railway, the Graving Dock and Railway Lands of the Province' shall be placed upon the market at the earliest date possible, and shall be offered for sale on liberal terms to actual settlers;

"(2) The said lands shall be open for entry to bona fide settlers in such lots and at such prices as the Governor in Council may determine;

"(3) Every person who has squatted on any of the said lands prior to the 19th day of December, 1883, aforesaid, and who has made substantial improvements thereon, shall have a prior right of purchasing the lands so improved, at the rates charged to settlers generally;

"(4) The Governor in Council may, from time to time, regulate the manner in which and terms and conditions on which the said lands shall be surveyed, laid out, administered, dealt with and disposed of; Provided, that regulations respecting the sale, leasing or other disposition of such lands shall not come into force until they are published in the *Canada Gazette;*

"(5) The Act, 43rd Victoria, chap. 27, intituled 'An Act to repeal the Act extending 'The Dominion Lands Acts' to British Columbia, and to make other provision with respect to certain lands in that Province,' is hereby repealed.

"XII. The three and one-half million acres of lands in that portion of the Peace river district of British Columbia, lying east of the Rocky mountains, and adjoining the Northwest Territories of Canada, granted to Her Majesty, as represented by the Government of Canada, by the said Act assented to on the 19th day of December, 1883, as aforesaid, intituled 'An Act relating to the Island Railway, the Graving Dock and Railway Lands of the Province,' and to be located by the said Government in one rectangular block, shall be held to be Dominion lands within the meaning of the 'Dominion Lands Act, 1883.'"

Although the respective jurisdictions of the Federal Government and the several provincial legislatures seem to be clearly defined by sections 91 and 92 of the British North America Act, 1867, many doubts and controversies have arisen as to the interpretation of these sections; and the perplexing questions as they have appeared have been settled only by appeal to the highest courts: the Supreme Court of Canada and the Judicial Committee of the Privy Council. On British Columbia joining the Confederation, it would be natural that the ordinary cases of doubt as to jurisdiction should arise as in the other provinces; but to add to the ordinary complications, there was created right through the heart of the province a narrow strip of Dominion lands, transferred by the province to the Dominion "in trust."

In drawing up the Terms of Union it is evident that there could have been no anticipation of the store of trouble that afterward fermented regarding the question of jurisdiction over various matters in this Railway Belt: precious minerals, waters, fisheries, navigable streams, beds of streams, foreshores, and Indian Reserves.

During the past forty years in America, the value of water resources, for such purposes as water-power, irrigation, lumbering, mining, etc., has become more and more important. British Columbia, like so many other countries and states, soon found that the English common law of riparian rights was not only not applicable to conditions but was opposed to the best modern principles of agricultural and industrial development depending on the use and diversion of water.*

* Reference should be made to an exhaustive article on "Water Legislation and Administration in British Columbia," by H. W. Grunsky, page D. 117, of the Report of the Minister of Lands of British Columbia, 1912. In this article, Mr. Grunsky gives a résumé of all water legislation in British Columbia from the first departure from the doctrine of riparian rights, by Governor Douglas' "Goldfields Act," 1859, down to the present British Columbia Water Act of 1912. The present Water Act and its administration are also discussed.

"The Goldfields Act" (1859), the "Land Act," the "Placer Mining Act, 1891," and the "Mineral Act, 1896," authorized the diversion and use of water for various purposes. The "Water Privileges Act, 1892," declared all unrecorded and unappropriated water to be vested in the Crown, and that no right to the permanent diversion or exclusive use of any water should be granted or conferred except by the Crown. The "Water Clauses Consolidation Act, 1897," consolidated all previous Acts dealing with water and its uses.

The trouble up to that time, and even to 1909, was not so much with the statutes as with their administration, and the supervision and protection of rights granted under the laws, although, too, it was extremely difficult to keep the legislation apace with the changing conditions arising from rapid development.

In 1907 the water rights question all through British Columbia having become acute, a Commission of Investigation was appointed, and after its report the British Columbia Water Act of 1909 was evolved. In its preamble this Act says:—

> "Whereas, in the past, records of the right to divert and use water have been honestly but imperfectly made, resulting in confusion and litigation. And whereas it is desirable that the rights of existing users under former records should be properly declared."

The salient feature of the British Columbia Water Act is the creation of a tribunal, called the "Board of Investigation," whose duties are to hold sittings and hear claims of all persons holding or claiming to hold records of water or other water rights; to determine the priorities of the respective claimants; to prescribe the terms upon which new licenses shall be granted; to cancel old records, etc.

THE WATER RIGHTS SITUATION IN THE RAILWAY BELT.

The Government of the Province of British Columbia, even after it had transferred the Railway Belt to the Dominion, continued to administer water and water rights within the Belt, claiming, as in the precious minerals case, which was decided in favour of the Province, "that the Dominion Government held the Railway Belt only in trust for railway purposes, and had no right therein except as an ordinary grantee."

From time to time the Department of the Interior, both officially and unofficially, questioned the provincial claim to the jurisdiction over water within the Railway Belt, but the matter came to a head only in 1906, when certain Dominion timber concessionnaires holding timber interests on Lillooet lake protested to the Department of the Interior that their rights would be injuriously affected by a provincial water grant allowing the Burrard Power Company to divert some 25 000 miner's inches of water from Lillooet river for water-power purposes. These timber men maintain that this grant would render the river useless for lumber purposes, and they demanded that the Dominion Government should protect their rights. A test case was made of this—"The King versus The Burrard Power Company"—the Dominion claiming "that the provincial grant of water to the power company was invalid and conveyed no interest to the defendant company, and asking that the same should be cancelled." After filing the information, the Attorney General of British Columbia was added as a party to represent the interests of the province.

The Exchequer Court of Canada decided in favour of the Dominion, on May 10, 1909. From this judgment an appeal was brought to the Supreme Court of Canada. The appeal was dismissed on February 15, 1910.

The Attorney General of British Columbia took the decision to the final court of appeal, the Privy Council, and on November 1, 1910, the Judicial Committee gave judgment upholding the decision of the other two courts.

THE JUDGMENT OF THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

On account of its great importance, the full text is given of the Privy Council's decision in the appeal from the previous judgments in the King versus Burrard Power Company case:—

"This is an appeal, by special leave, from the judgment of the Supreme Court of Canada, affirming a judgment of the Exchequer Court of Canada rendered on the 10th May, 1909. The only question raised upon the appeal is whether certain water rights in the Railway Belt of British Columbia are vested in the Dominion Government so as to preclude the Provincial Legislature from dealing with them. The circumstances in which the dispute has risen are shortly as follow: The province of British Columbia was admitted into the Dominion of Canada in the year 1871 under the provisions of the British North America Act, 1867. The admission was subject to the provisions of that Act and also to certain Articles of Union duly sanctioned by the Parliament of Canada and by the Legislature of British Columbia. The eleventh of these articles stipulated that the Dominion Government should secure the construction of railway communication between the railway system of Canada and the seaboard of British Columbia, and that the Government of British Columbia should convey to the Dominion Government 'in trust, to be appropriated in such manner as the Dominion Government may deem advisable in the furtherance of the construction of the said railway,' certain public lands along the line of railway throughout its entire length in British Columbia. In consideration of the land to be so conveyed in aid of the construction of the said railway the Dominion Government agreed to pay to British Columbia from the date of the union the sum of $100,000 per annum. The conveyance contemplated by this part of the eleventh article was effected by subsequent statutes of the Legislature of the province, and the land so conveyed is known as the 'Railway Belt.' The railway has now been built. By the Water Clauses Consolidation Act, 1897, 61 Vict., chap. 190 (Revised Statutes of British Columbia), section 4, the right to the use of the unrecorded water in any river, lake, or stream was declared to be vested in the Crown in the right of the province, and it was enacted that save in the exercise of any legal right existing at the time of such diversions or appropriation no person should divert or appropriate any water from any river, watercourse, lake, or stream, excepting under the provisions of the Act. By section 5 it was provided that no right to the exclusive use of such water should be acquired by any person by length of use or otherwise than as might be acquired or conferred under the provisions of the Act or of some existing or future Act. By section 2 'water' was declared to mean all rivers and water-power not being waters under the exclusive jurisdiction of the Parliament of Canada and 'unrecorded water' was declared to mean all water not held under a record under the Act or under certain repealed Acts or under special grant by public or private Act, and should include all water for the time being unappropriated or unoccupied or not used for a beneficial purpose.

"On the 7th April, 1906, the Water Commissioners for the district of New Westminster, British Columbia, purporting to act under the provisions of this Act, granted to the appellants, the Burrard Power Company, Limited, at an annual rental of $566, a water record for 25,000 miner's inches of water out of the Lillooet lakes and the Lillooet river to be used for generating electricity. These waters are within the Railway Belt.

"On the 26th December, 1906, the Attorney General for the Dominion of Canada filed an information in the Exchequer Court of Canada against the power company, claiming a declaration that the record was invalid and conveyed no interest to the defendant company and asking that the same should be cancelled. The information (which will be found set out on pages 717, 718 and 719 of the Record) alleged that the works of the power company if carried out would have the effect of diverting the water of the river, thereby interfering with its navigation, and would otherwise materially diminish the value of the lands of the Dominion Government in the Railway Belt. In support of the claim, reliance was placed on the agreement contained in the Terms of Union, and on the provisions of the Acts of the Provincial Legislature passed for the purpose of giving effect to that agreement. Reliance was also placed on the provisions of section 91 of the British North America Act, 1867, which declares that the exclusive legislative authority of the Parliament of Canada shall extend to all matters coming within certain classes of subjects, including the Public Debt and Property and Navigation. It was further submitted, that having regard to subsection 2 of section 131 of the Water Clauses Consolidations Act, 1897, the grant of the record by the Commissioners was not authorized by the Water Clauses Act.

"After the filing of the information the Attorney General of British Columbia was added as a party to represent the interests of the province.

"On the 23rd December, 1907, the determination of the issue of fact was referred for inquiry and report to Mr. Justice Archer Martin, who found the facts to be in accordance with the allegations of the Dominion Government, and reported accordingly. Thereupon the Attorney General of Canada prayed judgment as asked by the information. On the 13th April, 1909, the case came on for argument before Mr. Justice Cassels, and on the 10th May, 1909, that learned judge declared that the grant of the record of water in question was invalid and conveyed no interest to the defendant company. The judgment proceeded on three grounds: First, that the grant was an interference with property subject to the exclusive authority of the Dominion of Canada; secondly, that the diversion of water intended to be authorized thereunder would be a very serious interference with the navigability of the river; and thirdly, that the record was not authorized by the provisions of the Water Clauses Act under which it had been granted. The judgment as drawn up will be found at page 715 of the Record. From this judgment an appeal was brought to the Supreme Court of Canada. The appeal was dismissed on the 15th February, 1910.

"Their Lordships are of opinion that the judgments of the courts below are right. The grant by the province of British Columbia of public lands to the Dominion Government undoubtedly passed the water rights incidental to those lands. In the argument addressed to their Lordships this was not really questioned. But it was said that though the proprietary rights of the province in the land and in the waters belonging thereto were transferred to the Dominion Government, the legislative powers of the province over the same neither were nor could be parted with, and that therefore it was competent for the Provincial Legislature to enact the Water Clauses Act of 1897 under which the record was granted. In support of this contention a passage was cited from the judgment of Lord Watson in the Attorney General of British Columbia versus the Attorney General of Canada (1889), 14 Appeal Cases, p. 301. Their Lordships are of opinion that the contention is wrong, and that the passage in Lord Watson's judgment affords no kind of support for it. The object of article 11 of the Terms of Union was on the one hand to secure the construction of the railway for the benefit of the province and, on the other hand, to afford the Dominion a means of recouping itself in respect of the liabilities which it might incur in connection with the construction by sales to settlers of the land transferred. To hold that the province after the making of such an agreement remained at liberty to legislate in the sense contended for would be to defeat the whole object of the agreement, for if the province could by legislation take away the water from the land it could also by legislation resume possession of the land itself; and thereby so derogate from its own grant as to wholly destroy it. Lord Watson's reference in the Precious Metals Case to the eleventh article, so far from supporting the appellants' contention is against it. He says: 'The conveyance contemplated was a transfer to the Dominion to the provincial right to manage and settle the lands and to appropriate their revenue.'

"The grant of the water record in the case now under consideration is an attempt on the part of the province to appropriate the revenues to itself, and would if carried into effect violate the terms of the contract as interpreted by Lord Watson. It is true that Lord Watson adds that the land is not by the transfer taken out of the province, and that once it is 'settled' by the Dominion it ceases to be public land, and 'reverts to the same position as if it had been settled by the Provincial Government in the ordinary course of its administration.' But this also is against the appellants' contention, for it implies that until settled by the Dominion it remains public land under Dominion's control.

"Their Lordships are of opinion that the lands in question, so long as they remain unsettled are 'public property' within the meaning of section 91 of the British North America Act, 1867, and as such are under the exclusive legislative authority of the Parliament of Canada by virtue of the Act of Parliament. Before the transfer they were public lands, the proprietary rights in which were held by the Crown in right of the province. After the transfer they were still public lands, but the proprietary rights were held by the Crown in right of the Dominion, and for a public purpose, namely, the construction of the railway. This being so, no Act of the Provincial Legislature could affect the waters upon the lands. Nor, in their Lordships opinion, does the Water Clauses Act of 1897 purport or intend to affect them; for, by clause 2, the Act expressly excludes from its operation waters under the exclusive jurisdiction of the Dominion Parliament.

"Their Lordships will humbly advise His Majesty that the appeal should be dismissed with costs."

There has seemed to be some matter of doubt as to the date on which the transfer of the Railway Belt from the province to the Dominion was effected. This date of transfer is of importance, as drawing the line before which all water records granted by the province within the Railway Belt are valid, and after which most records are invalid.

By some it has been contended that, by the 11th article of the Terms of Union (1871) the province surrendered at that date its powers of disposition over its lands, including waters, except to alienate by pre-emption. And, therefore, that all water records granted by the province subsequent to 1871, in the district afterwards defined as the "Railway Belt," are invalid. This seems to be the opinion of Judge Gregory, in the cases George vs. Mitchell, and George v. Humphrey, in the Supreme Court of British Columbia, 1911.

There is also an opinion that the province ceased to have any jurisdiction over waters in the Railway Belt after it passed the Act of 1880 (43 Vict., chap. 11; assented to May 8, 1880), and that only those water records granted prior to May 8, 1880, are valid.

It appeals against the judgments of Judge Gregory in the cases George vs. Mitchell, and George vs. Humphrey, in the British Columbia Court of Appeal, November 5, 1912, the appeals were allowed, the judges deciding that all water records granted by the province within the Railway Belt before April 19, 1884, are valid. Or, the province of British Columbia did not cease to have jurisdiction to alienate water to settlers for irrigating purposes within what is now the "Railway Belt" until after the transfer effected by the Provincial Act, chap. 14, 1883 (assented to December 19, 1883) and confirmed by the Dominion Act, chap. 6, 1884 (assented to April 19, 1884).

DOMINION LEGISLATION NECESSITATED BY THE DECISION OF THE COURTS.

On account of this judgment by the Judicial Committee of the Privy Council in the King versus the Burrard Power Company case the opinion originally given for the guidance of the Minister of the Interior by the Dominion Department of Justice was upheld, viz., that the Railway Belt is the property of Canada within the meaning of section 91, paragraph 1, of the British North America Act, which assigns to the exclusive legislative authority of Parliament the public debt and property; consequently, the lands within the Railway Belt in British Columbia and all rights, including riparian and water rights connected therewith, which passed to the Dominion by the statutory grant of the province of British Columbia, and have not been transferred by the Dominion, are subject to the legislative jurisdiction of Parliament in the same manner and to the same extent as in the provinces of Manitoba, Saskatchewan and Alberta.

The then Minister of the Interior, Honourable Mr. Oliver, anticipating the judgment of the Privy Council, which would probably render necessary legislative action by Parliament to properly protect valid vested rights, and to provide machinery for administering water rights in the Railway Belt, introduced during the second session of the eleventh Parliament (1909-10), Bill No. 187, "An Act to confirm and declare the rights of the Crown for the Dominion with respect to water and water-power, and relating to the diversion, acquisition and use of water in the Railway Belt, British Columbia." This Bill, No. 187, received its first reading on March 23, 1910, but, although pressed by the Minister, opposition from different sources rendered necessary its withdrawal for that session.

Shortly after the Privy Council judgment was rendered (November 1, 1910), the Minister of the Interior, the Honourable Mr. Oliver, introduced in the third session of the eleventh Parliament, Bill No. 124 (short title, "The Railway Belt Water Act"), which was somewhat similar to the previous Bill. This Bill received its first reading on February 23, 1911, but on account of the press of business and the famous debate on the proposed reciprocity pact, its final consideration was delayed.

In November, 1911, the British Columbia Government prevailed upon the Dominion Government to transfer the administration over water rights in the Railway Belt to provincial control, the main arguments in favour of the transfer being that the province, albeit illegally, had administered the water for thirty years; that the water rights tangle was essentially a provincial responsibility, being of its own making; that the province already had an excellent Water Act, and was effecting an efficient administration; that one Water Act and one administration over the whole province would obviate the evils of a dual administration; and that the provincial water interests in the Belt were paramount, particularly as all lands and appurtenant rights escheated to the province upon passing into private hands.

Accordingly, "The Railway Belt Water Act" was passed by the Dominion Parliament, and assented to on April 1, 1912.

This Act is as follows:—

"2 GEORGE V, CHAP. 47.

"*An Act respecting the Water in the Railway Belt and Peace River block of land.*

"(Assented to 1st April, 1912.)

"His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

"1. This Act may be cited as The Railway Belt Water Act.

"2. In this Act, unless the context otherwise requires,—

"(a) 'domestic purposes' means and includes household, sanitary and fire protection purposes and the purpose of watering live stock;

"(b) 'watercourse' includes all natural watercourses or sources of water supply, whether usually containing water or not, and all streams, rivers, lakes, creeks, springs, ravines and gulches, and all water-power:

"(c) 'Railway Belt' means the land on the mainland of British Columbia granted to the Crown in the right of Canada by chapter 14 of the statutes of British Columbia of 1884 for the purpose of constructing and to aid in the construction of the Canadian Pacific railway;

"(d) 'riparian proprietor' means a person lawfully occupying lands adjoining and bordering upon any watercourse within the Railway Belt.

"3. The property in and the right to the use of all the water at any time in any watercourse within the Railway Belt shall, for all purposes, be deemed to be vested in the Crown, unless and until and except only so far as some right therein or in the use thereof inconsistent with the right of the Crown, and which is not a public right or a right common to the public, is established: Provided, however, that nothing in this Act shall be construed to affect any riparian right or rights to water in, on or appurtenant to those lands in the Railway Belt not granted by the Crown in the right of British Columbia to the Crown in the right of Canada or to affect any riparian right or rights to water in, on or appurtenant to lands which having been heretofore granted by the Crown in the right of Canada are not now vested in the Crown: Provided further that nothing in this section shall affect or alter the rights of any person in any action or proceeding now pending in any Court.

"4. No grant hereafter made by the Crown of lands in the Railway Belt, or of any interest therein, shall vest in the grantee any exclusive or other right, or privilege in, to or in respect of any watercourse, or in, to or in respect of the bed or shores of any watercourses, saving only the right of every grantee to appropriate in the ordinary manner so much of the water as to which he is a riparian proprietor as is reasonably necessary for his domestic purposes.

"5. The water so vested in and reserved to the Crown as aforesaid shall, during the pleasure of the Governor in Council, be administered under and in accordance with the provisions of the 'Water Act, 1909,' of British Columbia, as if the said Act was enacted by the Parliament of Canada, and the officers and authorities having powers and duties to exercise and perform under the provisions of the said Act shall have the like power and authority with respect to or in connection with the administration of the said water.

"6. The Governor in Council may direct that any Act, or portion thereof, hereafter passed by the legislature of the province of British Columbia relating to the water belonging to the Crown in the right of the province of British Columbia shall apply to the water vested in and reserved to the Crown under the provisions of this Act, as if such Act were enacted by the Parliament of Canada.

"(2) Every Order in Council passed under the authority of this section shall have force and effect only after it has been published for four consecutive weeks in *The Canada Gazette*, and every such Order in Council shall be laid before both Houses of Parliament within the first fifteen days of the session next after the date thereof, and such Order in Council shall remain in force until the day immediately succeeding the day of prorogation of that session of Parliament, and no longer, unless during that session it is approved by resolution of both Houses of Parliament.

"7. The Governor in Council may, at any time, repeal the provisions of section 5 of this Act, by proclamation to be published in *The Canada Gazette*, and upon the repeal of the said section, the water shall be administered under regulations to be made by the Governor in Council.

"8. This Act shall not come into force until a day to be named by proclamation of the Governor in Council, and such proclamation may issue when and as soon as it is agreed on the part of the Government of British Columbia that the water subject to the provisions of the 'Water Act, 1909,' of British Columbia shall be administered in accordance with the provisions of section 5 of this Act, and that the Government of British Columbia pay (but subject to such terms and conditions as the Governor in Council may prescribe for the protection of existing rights and interests) to the Receiver General of Canada the revenue derived from such administration, less the cost incurred by the said Government in connection therewith.

"9. Nothing in this Act shall be construed as conferring any interest in or authority or control over any lands belonging to the Crown in the right of Canada."

The object of this Act was: To transfer to provincial control the administration of all unrecorded waters in the Railway Belt, which waters has been declared by the Courts to be under the jurisdiction of the Dominion; the Act first affirmed that the ownership of all unrecorded waters was vested in the Crown, then proceeded to transfer the administration of such waters to the province under the British Columbia Water Act of 1909, during the pleasure of the Governor in Council.

Unfortunately, due to certain restrictive clauses and certain important omissions, the Railway Belt Water Act proved to be ineffective, and it was found necessary to amend it.

The Railway Belt Water Act, 1913, was accordingly passed, which is as follows:—

"3 GEORGE V, CHAP. 45.

"*An Act to amend the Railway Belt Water Act.*

"(Assented to 6th June, 1913.)

"His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

"1. This Act may be cited as The Railway Belt Water Act, 1913.

"Paragraph (*c*) of section 2 of chapter 47 of the statutes of 1912, is repealed and the following is substituted therefor:—

"'(*c*) 'Railway Belt' means the lands on the mainland of British Columbia granted to the Crown in the right of Canada by chapter 14 of the statutes of British Columbia of 1884 for the purpose of constructing and to aid in the construction of the Canadian Pacific railway, excepting thereout and therefrom all reserves or areas that are or may be set apart and designated as Dominion Parks.

"3. Section 2 of the said chapter 47 is further amended by adding thereto the following paragraphs:—

"'(*e*) 'Minister' means the Minister of the Interior of Canada;

"'(*f*) 'Water Act' means and includes the 'Water Act' of British Columbia, the Acts in amendment thereof passed before the third day of March, nineteen hundred and thirteen, and any Act passed by the legislature of the province of British Columbia which, under the provisions of section 6 of this Act, is made to apply to the water in the Railway Belt;

"'(*g*) 'Board' means the tribunal constituted under the 'Water Acts,' and therein described as the 'Board of Investigation.'

'4. Sections 3, 4, 5 and 6 of the said chapter 47 are repealed and the following sections are substituted therefor:—

"'3. The property in and the right to the use of all the water at any time in any watercourse within the Railway Belt shall, for all purposes, be deemed to be vested in the Crown, unless and until and except only so far as some private right therein or in the use thereof inconsistent with the right of the Crown has been or may be lawfully established, and except that nothing in this section shall affect or alter the rights of any person in any action or proceeding now pending in any court.

"'4. No grant hereafter made by the Crown of lands in the Railway Belt, or of any interest therein, shall vest in the grantee any exclusive or other right, title or privilege in, to or in respect of any watercourse, or in, to or in respect of the bed or shore of any watercourse, unless and except in so far as any right, title or privilege to the bed or shores of any watercourse is expressly set out and described in such grant, saving the right of every riparian proprietor to the use of water for domestic purposes.

"'5. All records, grants, licenses, Orders in Council, or contracts of, for or affecting the use of water within the Railway Belt, heretofore granted or made by or on behalf of the Government of Canada or the Minister, shall, notwithstanding anything in this Act, be and be deemed to be valid and effective and shall be given effect to.

"'(2) Subject to the property in and the rights to the use of water referred to in subsections hereof,—

"'(*a*) all water without distinction within the Railway Belt shall, during the pleasure of the Governor in Council, for the purpose of administration be under the exclusive control of the authorities of the Province of British Columbia and be administered under and in accordance with the Water Acts as if the said Acts were enacted by the Parliament of Canada, and the officers and authorities having powers and duties to exercise and perform under the provisions of the Water Acts shall have the like powers and authority with respect to or in connection with the administration of the said water, and

"'(*b*) all records, grants, licenses, Orders in Council, claims or contracts of, for or affecting the use of water within the Railway Belt heretofore granted, or purporting or *bona fide* claimed to have been granted, by any provincial or local authority and all applications to any such authority for records, grants, licenses, Orders in Council, claims or contracts of, for or effecting the use of water within the Railway Belt heretofore made and now pending shall be deemed to be valid and effective to the same extent for the like purposes, and subject in the like manner to the jurisdiction of the Board, (and shall be subject to all the obligations and limitations imposed by the Water Acts), as if made, issued, authorized, claimed or pending with respect to water in British Columbia not within the Railway Belt.

"'(3) All applications or claims for the use of water within the Railway Belt heretofore made to the Government of Canada or the Minister, and now pending, shall be deemed to be valid and effective and shall be subject to the jurisdiction of the Board and given effect to under the provisions of the Water Acts to the same extent and for the like purposes as if such applications or claims had been made or were pending by, to or before the competent provincial or local authority under the provisions of the Water Acts with respect to water in British Columbia not within the Railway Belt.

"'(4) All waters for irrigation allotted to Indians or Indian Reserves, wh er allotted by the Indian Reserve Commissioners or recorded in Dominion or Provincial Government offices, and all applications to any provincial or local authority for the use of water within the Railway Belt in the interest of Indians or Indian Reserves, shall be deemed to be valid and effective and subject to the jurisdiction of the Board and given effect to under the provisions of the Water Acts as if made, issued, authorized or pending by, to or before the competent provincial or local authority under the provisions of the Water Acts with respect to water in British Columbia not within the Railway Belt.

"'6. The Governor in Council may direct that any Act, or portion thereof, passed by the legislature of the province of British Columbia after the third day of March, nineteen hundred and thirteen, relating to water in the province not within the Railway Belt shall apply to the water in the Railway Belt as if such Act were enacted by the Parliament of Canada.

"'(2) Every Order in Council passed under the authority of this section shall have force and effect only after it has been published for four consecutive weeks in *The Canada Gazette*. Every such Order in Council shall be laid before both Houses of Parliament within the first fifteen days of the session next after the date thereof, and such Order in Council shall remain in force until the day immediately succeeding the prorogation of that session of Parliament, and no longer, unless during that session it is approved by resolution of both Houses of Parliament.

"5. Section 8 of the said chapter 47 is amended by striking out the words 'Water Act, 1909, of British Columbia' in the fifth and sixth lines thereof and substituting therefor the words 'Water Acts.'

"6. Section 9 of the said chapter 47 is amended by adding thereto the following: Provided that any order, permit, license or certificate made under the authority of the Water Acts authorizing the construction and maintenance of any works upon or the use or occupation of any such lands shall be valid and effective to authorize such construction, maintenance, use or occupation if approved by the Minister, and subject to such terms and conditions as the Minister may prescribe, and any such order, permit, license or certificate shall be of no effect, until so approved; Provided also that any order, permit, license or certificate made under the authority of the Water Acts authorizing the construction and maintenance of any works upon or the use or occupation of any Indian reserves or Indian lands shall be valid and effective to authorize such construction, maintenance, use or occupation if approved by the Superintendent General of Indian Affairs and subject to such terms and conditions as the said Superintendent General may prescribe, and any such order, permit, license or certificate shall be of no effect until so approved; provided also that nothing in this Act shall be construed as limiting or preventing the reclamation, under the authority of the Minister, of any lands."

THE RAILWAY BELT HYDROGRAPHIC SURVEY.

The Railway Belt Hydrographic Survey was inaugurated in May, 1911, under the direction of Mr. J. B. Challies, C.E., then hydraulic engineer of the Railway Lands Branch, and now Superintendent of the Water Power Branch. Mr. P. A. Carson, B.A., D.L.S., was appointed chief engineer and placed in direct charge of the survey in British Columbia.

The objects of the survey were: (1) To investigate the complex water rights situation on the ground; (2) to suggest a practicable and efficient form of Dominion water administration; (3) to study the water supply of all streams and the water resources of the Railway Belt; (4) to investigate storage possibilities with a view to conserving and beneficially using the limited water supply; (5) to make the surveys necessary to the proper conservation and use of the said water resources; and (6) to report on the various irrigation, reclamation and water-power projects before the Department.

On account of the scarcity of water in the 'Dry Belt,' and its extensive use for irrigation, the water rights tangle was in its most acute and complicated form in the arid district. Consequently, during the season of 1911, the investigations and studies of the hydrographic survey were devoted almost entirely to the Dry Belt.

Water records giving to individuals the right to divert and use water were granted in British Columbia as far back as 1860. These records were doubtless recorded by the applicant, and granted by the Government honestly and in good faith, but it is evident that the Government could not have anticipated the terrible confusion and endless trouble that followed from the irregular methods of administration. The older records, indeed even up to 1897, were merely made out in long hand in blank registers at the different Government offices, the applicant asking for and receiving without question the right to use any quantity of water from 100 to 1,000 miner's inches without any consideration of his real needs or a knowledge as to whether the stream could supply the quantity of water called for by the record. No track was kept of the various grants from the same source, and many streams were recorded ten times beyond their available supply. In many cases, the record holder did not receive a copy of his record, and the present owners of the appurtenant land have great difficulty in establishing their claim to the use of the water. In some records the quantity of water is not mentioned; or the purpose is not specified; or the appurtenant land is not mentioned or described; or, sometimes, the source of supply is either unnamed or it is almost impossible to identify or locate it.

There were no regular offices for the purpose of recording these water rights, but each land office performed the duties in its own inimitable manner. No system of numbering or registering by districts was attempted, and the water records from any particular stream in the Dry Belt may be scattered in the old books of any of the following offices: Yale, Lytton, Nicola, Ashcroft, Clinton, or Kamloops.

The whole province of British Columbia was in the same state up to the decision of the courts in the Burrard Power Company case, but at least the new British Columbia Water Act of 1909, gave promise of better days. With that decision, however, the water rights situation in the Railway Belt gave rise to alarming complications. Previously, the holders of water records were, or thought they were, protected by law, whereas afterward, the legal status of most records was in doubt.

Unfortunately the situation was aggravated by the extreme dryness of the years 1910 and 1911. When once the news was spread broadcast that the water records had no longer a legal standing, everyone commenced looking out for himself, and water grabbing became the order of the day. The rivalry of water users is proverbial even under the best administrated laws. The very origin of the word "rivals" indicates the tendency of man to dispute over questions of water, its derivation being from the Latin "rivus" (a river or ditch) and "rivals" signifies those who quarrel about water. So it can be imagined what the situation in the Railway Belt became when there were not even laws to protect rights.

During the summer of 1911, the engineers of the Hydrographic Survey came in close touch with the various phases of the situation on the ground, and it was soon comprehended how unenviable was the legacy that the courts had decreed was a Dominion trust. The stumbling blocks to a Dominion administration were many, the principal one being the lack of Dominion jurisdiction over water records granted before the Railway Belt came into existence. Water grants are not like land grants, each separate and distinct in itself. Each grant of water is dependent upon all prior grants from the same source of supply; and the early provincial records, over which the Dominion had no jurisdiction, practically controlled the whole situation, and precluded the possibility of a satisfactory Dominion administration independent of provincial co-operation.

Moreover, even new water records could not be granted until the indefinite status of all the early rights were adjudicated, established and defined: for new rights would necessarily be subordinate to earlier rights, and no matter how accurately the new rights might be defined as they were granted, they would remain indefinite so long as prior rights remained indefinite. Adjudication of old rights was necessarily the first step, and unfortunately the Dominion had no authority to make the adjudication.

The following enumeration of the various kinds of water rights in the Railway Belt will give some idea of the complexity of the situation: Water records granted by the province before the Railway Belt existed; water records granted by the province after the formation of the Belt, but appurtenant to old provincial lands; water records granted by the province after the Belt was formed, and appurtenant to lands which had escheated from the Dominion to the province; water records granted by the province appurtenant to unpatented Dominion lands; water records granted by the province for Indian Reserves; water records granted for Indian Reserves by the Indian Reserve Commissioners; rights to the use of or affecting the use of water, granted by the Dominion Government; incompleted water-power projects under contract with the Dominion, to which water rights were clearly incidental; rights to the use of water by Dominion timber concessionaries; indefinite and unestablished riparian rights of riparian proprietors.

There were, in addition, other phases that complicated the authority of both Governments. Streams that have their source in the province and flow into the Belt, and vice versa, could not be dealt with by one Government without affecting the rights and interests of the other. Water rights could not be administered independently of the land, for power rights demand land for power sites and storage reservoirs, and irrigation rights require rights of way for canals and land for reservoir purposes.

Owing to the impracticability of a purely Dominion administration of water in the Railway Belt, it was decided to transfer the administrative control thereof to the province, during the pleasure of the Governor in Council. This part of the question has already been discussed herein.

INAUGURATION AND INVESTIGATIONS.

> "In all investigations of water resources the most important factor is the available water supply. Not only is this the most important factor, but is also the factor that requires the longest time to determine satisfactorily, owing to the great fluctuation in stream flow from year to year. In a study of the water resources of a country or district, the logical order of the investigation is: (1) stream gauging to determine the amount of water available, under existing conditions, for domestic and municipal water supply, irrigation, water-power, navigation, sewage disposal, etc., and the amount to be taken care of in flood prevention work and drainage; (2) river surveys to determine the fall available for correcting flood conditions, improving drainage, and developing water-power; (3) storage studies for the purpose of equalizing the flow, thereby reducing the floods, conserving the surplus, and increasing the low-water flow, in the interest of the above-mentioned subjects. The study of the available water supply must evidently be attempted first, for we must have a thorough knowledge of present conditions before we try to improve those conditions.
>
> "As records of stream flow to be of value must extend over a series of years in order to determine the range of stage, that subject must be taken up first."

(Quoted from a report by Robert Follansbee, District Engineer of the United States Hydrographic Survey.)

In organizing the Railway Belt Hydrographic Survey, with its many objects and undertakings, it was decided to study the water resources in a comprehensive manner, and with the most modern methods. Accordingly, for the purely hydrographic work the methods of the United States Hydrographic Survey were adopted almost to the minutest detail. Personal knowledge was obtained of the field methods in several of the western districts and of the office methods at Washington, and too much cannot be said of the kindness and courtesy of the officials and engineers of the United States service in this regard.

It is not proposed to enter here into a discussion of the theory and methods of the Hydrographic Survey. They can be found exhaustively in the many Water Supply Papers of the United States Geological Survey.

In order that the greatest efficiency should be attained, and early mistakes avoided, one of the expert hydrographers of the United States Survey, Mr. C. R. Adams, was borrowed from Washington for a period of three months. Under Mr. Adams' direction a number of gauging stations were established on the principal and contentious streams of the Dry Belt. Discharge measurements were taken; systematic gaugings were commenced; the hydrographers were instructed according to the most approved methods; and the whole work commenced in smooth working order.

STAFF.

During 1911 the staff of the Hydrographic Survey was as follows:—

P. A. Carson, B.A., D.L.S.—Chief Engineer.
W. M. Carlyle, B.A. Sc.—Assistant Engineer. (Resigned February 17, 1912.)
C. G. Cline, B.A.Sc., D.L.S.—Assistant Engineer.
C. E. Richardson, B.A.Sc.—Assistant Engineer.
K. H. Smith, B.A.—Assistant Engineer (from September 13, 1911, to January 26, 1912).
A. T. Milner—Clerical Assistant (transferred January 29, 1912).

During 1912, the staff was:—

P. A. Carson, B.A., D.L.S.—Chief Engineer.
C. G. Cline, B.A.Sc., D.L.S.—Assistant Engineer.
E. M. Dann, D.L.S.—Assistant Engineer.
H. J. E. Keys, B.A.—Assistant Engineer (from April 1, 1912.)
C. E. Richardson, B.A.Sc.—Assistant Engineer.
Miss Allan.—Stenographer.
Mr. B. Corbould—Assistant Engineer (For June, July and August).
Mr. H. C. Hughes—Assistant Engineer (for June, July and August.)

During June, July and August, of 1911, Messrs. Carlyle, Cline and Richardson investigated water rights in the dry portion of the Railway Belt, tracing old records and making lists thereof; reporting on water supply in each locality, and whether the water was being beneficially used; inspecting ditches, flumes, storage dams and reservoirs; making a rough survey of the acreage of irrigable and cultivated land appurtenant to the records; these assistant engineers also established gauging stations and made numerous measurements of stream flow.

During September and October, Mr. Richardson extended the hydrographic work as far east as Revelstoke and Golden (district No. 3 and part of No. 4), establishing gauges and making meterings.

In October, Messrs. Cline and Smith extended the work into the Coast district

(No. 1) and investigated a number of important developed and undeveloped power streams, establishing gauging stations where advisable.

The chief engineer superintendended the general hydrographic work and, as well, inspected and reported upon all irrigation, reclamation and water-power projects, and all matters relating to water and water rights.

During 1912, the Hydrographic Survey work was continued with renewed vigour, particularly with reference to stream measurement.

Mr. Cline was in charge of district No. 1 (Coast district), Messrs. Dann and Keys attended to district No. 2 (Dry Belt) with the assistance of Mr. Corbould, a temporary assistant during the summer months of June, July and August. Mr. Richardson had charge of district No. 3 and 4, assisted by Mr. Hughes in district No. 4 during June, July and August.

SCOPE OF INVESTIGATIONS.

The investigations herein published are by no means complete, nor do they cover and include all the streams and sources of water supply in the Railway Belt. The scope of the work done, and the territory covered, was limited by the available funds, the staff of engineers and hydrographers, and the time at our disposal. Rome was not built in a day, and a comprehensive hydrographic survey cannot be fully established even in a couple of years. The field covered has been partly governed by the exigencies of the Railway Belt water rights situation, which demanded our more concentrated energies in the irrigation district of the 'Dry Belt,' although the work has since been extended over almost the whole Railway Belt, until we feel that the territory covered is the largest and the class of work done is the best under the circumstances.

Before the inauguration of the Hydrographic Survey, there were practically no data of stream flow in the Belt, except certain studies by large irrigation and water-power companies, such as the British Columbia Fruitlands, the Vancouver Power Company and the Western Canada Power Company. There were, it is true, certain isolated and sporadic data obtained by private individuals and engineers which conveyed some information, but this is of little value to systematic and co-related studies.

In establishing a permanent Hydrographic Survey, it was deemed advisable to lay the foundations broad and deep, by commencing the study of as many representative streams as possible, particularly establishing gauging stations on most streams of known importance or of a contentious nature. Gauge readings first, measurements of stream flow next, then storage and conservation investigations, with necessary surveys, all with the object of the most beneficial use of the available supply for all purposes. The work might have had more immediate scientific value if our endeavours had been concentrated on a few typical drainage areas, but we are firmly of opinion that in the long run our more comprehensive programme is the better one, from both practical and scientific standpoints.

While it is believed that the stream flow data already obtained are of themselves sufficiently accurate for ordinary practical purposes, the records do not cover a long enough period to warrant reliance on any general deductions drawn therefrom. It is essential that records of stream flow should be kept during a period of years long enough to determine within reasonable limits the entire range of flow from the absolute maximum to the absolute minimum. The length of such a period manifestly differs for different streams. Experience of the United States Hydrographic Service has shown that the records for some streams should cover five to ten years, and those for other streams twenty years or even more, the limit being determined by the relative importance of the stream and the interdependence of the results with other long-time records on adjacent streams.

All persons re cautioned from placing too great reliance on the incomplete records here pub. shed, and from drawing general deductions from the specific data of two particular years. In spite of our own admonition, however, we are willing to assist engineers and the public in drawing rough estimates regarding stream fl , based on the results of our two seasons' investigations, our knowledge of these and previous years, evidence of high-water marks, precipitation, etc., and the recollections of old timers.

In the Dry Belt, the years 1910 and 1911 saw the culmination of a dry cycle which had been tending since the last flood year, 1903. The year 1912 was one of more than average run-off in the easterly part of the Dry Belt, but by no means a maximum year. Near Spence's Bridge and Lytton the run-off in 1912 was below the average. The winter of 1911-12 set in early in November with a very cold snap. After the ground had frozen the snow came. There were no very warm Chinooks during the winter, and the April and May sun caused a rush of the flood water in the surface streams, very little water percolating into the soil either as subsurface flow, or to elevate the level of the water table. During the summer some he..vy rains occurred in the Dry Belt which kept up the flow of the surface streams fairly well even in July and part of August. There was very little water scarcity during 1912 and, on account of the summer rains, a smaller quanti.y of irrigation water was really used.

In the Coast district the year 1912 was about an average year.

In Revelstoke and Upper Columbia districts the total run-off was below normal. In all the large rivers, Columbia, Thompson, and Fras r, the maximum for the year was greatly below the years 1894 and 1903.

HYDROGRAPHIC DISTRICTS IN THE RAILWAY BELT.

The Railway Belt may be conveniently divided into four hydrographic r water districts:—

(1) Lower Fraser drainage, or Coast district.
(2) Thompson drainage, or Dry Belt.
(3) Shuswap Lake drainage.
(4) Columbia drainage.

District No. 1.—The first district, or, as it is commonly called, the Coast district, consists of the lower Fraser drainage, and extends from the Pacific coast northeasterly for about 175 miles, to above Lytton and the mouth of Thompson river. Besides the Fraser itself, it includes all its tributaries, large and small, with the exception of the Thompson, which, on account of its size and importance, has been treated as a separate drainage district. In addition to the streams that actually drain into the Fraser, there are included in district No. 1, those streams that flow into Burrard inlet and other arms of the strait of Georgia (e.g., Mesliloet river) as they are not of sufficient importance to be considered separately.

The Coast district, at its lower or westerly limit, is one of excessive humidity, the precipitation in some cases exceeding 150 inches, and on the whole ranges from sixty to seventy inches in the valleys, and from 80 to 150 inches in the higher elevations.

The climate is comparatively mild, with but little snow in the valleys. The mean snowfall in Vancouver is only about 20 inches, although early in January, 1913, some 4 feet of snow fell in that city. The rainy season generally lasts from October to March. The summers are cool with an abundance of rain in the growing season.

Proceeding inland the humidity decreases. At Hope, about 75 miles from the coast, the annual precipitation is about 30 inches, the snowfall is greater, and the rainfall during the summer season less. The winters are also colder and the maximum summer temperature higher.

At Lytton, 150 miles from the coast, the Dry Belt or arid region has been reached. Here, at the mouth of Thompson river, the precipitation is only from 9 to 11 inches, with hot dry summers and cold dry winters. The Fraser valley above Lytton is in the Dry Belt for over a hundred miles. The main characteristics of the Dry Belt will be discussed under district No. 2.

In the lower Coast district, the plant and tree growth is very luxuriant. Enormous fir, cedar, hemlock, etc., some of the former being from 10 to 15 feet in diameter. The timber industry is of great importance. The undergrowth is of the rankest description, with ferns, nettles, devil's club and alder. No irrigation is necessary. The study of stream flow and water supply is of the greatest importance in connection with water-power. The district is a mountainous one (5,000 to 7,000 in elevation), and on all streams, large and small, there is considerable fall before the waters reach the main artery, the Fraser, which conducts them to the sea. Already two of the best powers, from an economic standpoint, have been developed, viz., the Coquitlam-Buntzen hydro-electric power development (by the Vancouver Power Company) and the Stave river by the Western Canada Power Company. These two companies supply hydro-electric power to the city of Vancouver, and the former for its urban and suburban electric tram lines.

The following industrial powers will probably be developed in the near future, or according as the progress of the Coast requires: Chehalis river, Lillooet river, Jones lake, Chilliwack river, Nahatlatch river, Coquihalla river, etc., some of them being capable of developing up to 30,000 horse-power. Most of these rivers are being investigated by private companies, and hydrographic data are being gathered, the Hydrographic Survey co-operating in the work. In addition, there are numberless small powers that can be conveniently and economically developed for private purposes or small industrial uses.

About thirty-three river stations have been established in the Coast district, determining the daily, monthly, yearly, maximum and minimum flow, etc., and investigating the storage possibilities. At the same time, the importance of stream flow in connection with domestic and municipal water supply, drainage and flood prevention has not been forgotten. The run-off of the coast streams is also of importance to the sewerage problem of the growing cities of the Burrard peninsula.

District No. 2.—This district is the lower or major part of the Thompson drainage, and is commonly called the 'Dry Belt.' It is an arid strip of territory about 100 miles in width, extending from about Lytton on the west to the town of Chase on the east, about 30 miles east of Kamloops. It comprises such well-known valleys and communities as Lytton, Spence's Bridge, Nicola valley, Ashcroft, Walhachin, Savona, Kamloops, North Thompson valley, Cherry creek, Monte creek and Grande Prairie, although the last-mentioned really belongs to district No. 3, being at the head-waters of Salmon river.

In general, district No. 2 consists of the main Thompson and its many tributaries from Lytton to Kamloops; the North Thompson within the Railway Belt; and the South Thompson from Kamloops to Chase.

The Dry Belt is made up of narrow valleys and rolling plateaus, covered mostly with scattered bull pine and small timber. On the highest mountains (elevation 5,000 feet to 6,000 feet) are also good fir and some cedar and hemlock. The soil is of the distinctively arid type, sandy soil or sandy loam, with gravelly or sandy subsoil. In some places there is an abundant growth of cactus and sage bush. These lands are very fertile when irrigated, the warm sandy soil producing a kind of hot-house growth. Fruit-growing is successfully carried on, but especially alfalfa, timothy, grain, vegetables (potatoes, tomatoes, onions, melons, etc.), and indeed almost all crops known to mixed farming.

The Fraser valley above Lytton and the Thompson valleys range from 700 to 1,200 feet in elevation, and are irrigated mostly by gravity supply from the numerous creeks and rivers which cut the main valleys transversely in deep gorges. The lands in the back valleys are higher in elevation, from 1,500 to 3,000 feet, and their productiveness is limited, by early frosts and the shortness of the growing season, to hay and the hardy crops and to stock raising.

The mean annual precipitation in the Dry Belt is only from 8 to 12 inches per annum in the valleys and from 10 to 15 inches in the hills. The rainfall in the summer is very small. The snowfall in the valleys is only from 12 to 24 inches, but is as great as 4 to 6 feet in the hills. The summers are extremely hot (105° F.) and dry, and the winters cold and dry (−20° to −40° F.).

The study of stream flow in the Dry Belt is of the greatest importance in connection with irrigation, particularly the numerous large and small tributaries of the Thompson, as it is from these myriad streams, more or less reliable in their supply, that all the irrigation water is obtained.

The warm sun in April and May, assisted by earlier Chinook winds, melts the snow in the hills at the head-waters of the streams, and an enormous freshet flow generally takes place between the second and third week of May. This flow quickly subsides in June. In July and August many of the streams are dry, just when water is badly needed for irrigation. The fall rains are not heavy, and they cause merely a perceptible increase in the low flow of the creeks. In the winter, the streams are almost completely bound up by the frost and snow.

The conservation of these surplus waters of the spring floods by the construction of storage works is doubtless the solution of the water scarcity in the Dry Belt, and the measure of the future agricultural potentiality of the interior of British Columbia.

Nearly every stream in the Dry Belt is being used more or less for irrigation, but only sporadic efforts have been made to properly conserve the flashy supply. The irrigation is mostly carried on by individual farmers with small private ditches, there being very little co-operation either in storage works or irrigation systems.

The small irrigation ditches are, on the whole, crudely constructed, and a great deal of water is lost in transmission. In a word, irrigation in the Dry Belt of British Columbia cannot be described as a science. On the other hand, the past few years have seen the formation of several large irrigation companies which have constructed modern and expensive storage works, with excellent main canals and distributing systems. It is anticipated that a vigorous policy of Government supervision of the use and control of water will be pursued under the present British Columbia Water Act.

Most of the important streams in the Dry Belt have been systematically studied by the Hydrographic Survey, investigating the daily, monthly and seasonal run-off, with a view to securing a complete knowledge of the water supply, and its behaviour, in order to properly advise as to its conservation and assist in the administration of its use. The numerous private storage dams and reservoirs have been inspected, together with the intakes, ditches, flumes, distributing systems and methods of applying water. The losses in transmission in many canals and ditches have been investigated and measured. Storage lakes, reservoirs, and sites of all kinds have been reconnoitred, an estimate made of their capacity, the quantity of available water for storage, and the nature, size, cost, etc., of the necessary storage dams and works.

On account of the system of granting water records lately in vogue, both for ordinary use and for storage, it seems improbable that co-operative construction of storage works can be obtained among the individual record holders. In the general interests of the irrigators and farmers, the Government itself, and the whole district at large, it would seem that a policy of Government construction of storage works is the best and final solution to the conservation question. The Government assists ordinary agriculture by constructing roads, etc., by experimental farms, and grants of money. The timber industry is assisted in many ways, and recent forest laws show a tendency to Government conservation of timber, its reforestration and fire protection. Similar remarks can be made of mining and fishing. But what has ever been done for that natural resource, water, the value of which can be well contrasted with any of those previously mentioned? Some day, unless the rights granted under the present water laws preclude the possibility, the Government should undertake the construction of extensive storage works in order to conserve the valuable resource, the ownership and use of which has been declared to be vested in the Crown as a public asset.

Although the exigencies of irrigation in the "Dry Belt" demanded first consideration, the requirements of domestic and municipal water supply have also been remembered. There are also a number of streams where power could be developed, although on account of the small winter flow it is doubtful if they could be used as other than summer powers, except on a small scale. These are Spius creek, Murray creek, Stein creek, Bonaparte river, Deadman river, Paul creek and Louis creek.

About 69 streams in the Dry Belt were systematically studied during 1911 and 1912 and, on 30 others, miscellaneous measurements were made.

The run-off of the irrigation streams in the Dry Belt was very small in 1911, which was an abnormally dry year. In 1912, the run-off was about normal in the greater portion of the Belt, except towards Spence's Bridge and Lytton, where it was again small. During the summer of 1912 some very heavy rains occurred which decreased the quantity of water necessary for irrigation.

District No. 3, or Shuswap Lake drainage, extends from the outlet of Shuswap lake, near the easterly limit of the Dry Belt, to the summit of the Gold range, near Eagle pass, and includes the area draining into Shuswap lake. This district is in reality part of the Thompson drainage, but for convenience is considered as a separate district. It comprises such streams as Adams river, Salmon river, Shuswap river, Eagle river, Anstey river and Seymour river. The precipitation ranges from 12 to 15 inches near the head of Salmon river (in Grande Prairie) which is in the Dry Belt, to about 40 to 50 inches at the summit of the Gold range. Around Salmon Arm and the northerly part of Okanagan valley (near Armstrong and Enderby), the climate is semi-arid, with a precipitation of from 15 to 21 inches, but the amount in the growing season is sufficient to render irrigation unnecessary. There are no evidences of aridity, such as bull pine, sage bush or cactus. Fruit-growing is successfully carried on, and all kinds of mixed farming, but in the greater portion of the district there is little agricultural development, the land being rolling and rather hard to clear. There is excellent timber in nearly all the valleys and on the mountain sides.

Shuswap lake is at an elevation of 1,154 feet (high water), and the surrounding mountains rise to an elevation of 6,500 feet. At the summit of Gold range they are between 7,000 and 8,000 feet.

Just at the easterly limit of the Dry Belt is one of the most important undeveloped water-powers in the interior of British Columbia. Adams river falls about 190 feet in six miles and is only a few miles from the main line of the Canadian Pacific Railway. The river has a mean discharge of about 2,500 cubic feet per second, and Adams lake, with an area of 60 square miles, affords an excellent storage reservoir. Hydro-electric power from Adams river should be of great importance to the agricultural development of the South Thompson valley, for by this power water could be cheaply pumped to irrigate the arid valley lands lying adjacent to the Thompson.

About thirteen hydrographic stations were established in district No. 3. It is planned shortly to make a reconnaissance of the streams flowing into Shuswap lake from the north, as this part of the district has not yet been investigated.

District No. 4, or the Columbia drainage, extends from the easterly slope of the Gold range to the summit of the main Rockies, which is the easterly boundary of British Columbia and the Railway Belt, inc!uding the snowy Selkirks.

The greater part of the Columbia drainage lies outside the Railway Belt, so we are mainly concerned with that portion above and below Revelstoke and the upper Columbia from Beavermouth and Golden to lake Windermere.

For an exhaustive discussion on Columbia river, see the river stations on that stream.

Around Revelstoke the climate is humid (40 to 45 inches) with short, hot summers, cool evenings and very severe winters, with heavy snowfall. Owing to the heavy timber, the land is difficult to clear, and the agricultural development has been slow. There is excellent timber in the whole district, which is being extensively logged and sawn at the mills. Some mining is also done.

The elevation of Columbia river at Revelstoke is 1,450 feet. The mountains rise to an elevation of 8,000 and 9,000 feet, and at the summit of the Selkirks, up to 10,000 and 11,000 feet.

There are a number of good undeveloped water-powers around Revelstoke, viz., Illecillewaet river, Akolkolex river, Jordan river, and Incomappleux river, as well as the Columbia itself, five miles above the town of Revelstoke. A power plant has already been installed on Illecillewaet river by the town of Revelstoke for lighting and power purposes.

There are practically no interests on Columbia river from Golden to the north limit of the Railway Belt, except timber. Power could be developed on Blaeberry river and possibly on Beaver river. The valley is at an elevation of over 2,000 feet, and the mountains rise to an altitude of 9,000 to 10,000 feet. The precipitation ranges from 40 to 70 inches, and the snowfall is heavy, with a cold, severe winter.

The only important tributary of Columbia river from the direction of the main Rockies is Kicking Horse river, important interests of which are discussed under that stream.

The upper Columbia valley from Golden to Windermere is an arid district, the moisture-laden winds from the west simply passing over the valley, leaving it almost devoid of precipitation (about 17 to 21 inches around Golden, and from 8 to 12 inches near lake Windermere). For a complete description of the upper Columbia valley, see "Columbia river" hereinafter.

About twenty-three river stations have been established in District No. 4, beside numerous miscellaneous measurements on more or less important creeks.

WATER AND STREAM FLOW.

"There is no single substance entering into the structure of the earth which has played and is playing so important a part as water. It penetrates the soils, sands, and rocks of the land areas in such large quantities that sand and limestones lying below water level may contain as high as 38 per cent of their volume of water. Even the quantity stored in soil, gravel and clay is very large. The water in a saturated soil or clay may range from 22 per cent up to 40 and even 50 per cent of its dry weight."—(Professor F. H. King.)

"Water has the greatest direct influence upon man, his health and industries. Its quality, and especially its quantity, directly affect his occupations. If there is too much, the ground is marshy, malarial, and unfit for cultivation; if too little, the plants valuable for food do not thrive. There is a narrow range between excess and deficiency, and upon the nice adjustment of the balance between moisture and drought depends the existence of prosperous communities."—(Newell.)

"The waters of the earth are taken up by the process which we call evaporation and formed into clouds, to be again precipitated to earth in the form of rain or snow. Of the water which falls upon the basin of a stream, a portion is evaporated directly by the sun; another large portion is taken up by plant growth and mostly transpired in vapour; still another portion, large in winter but very small in summer, finds its way over the surface directly into the stream, forming surface or flood flows; finally, another part sinks into the ground, to replenish the great reservoir from which plants are fed and stream flow maintained during the periods of slight rainfall, for the rainfall is frequently, for months together, much less than the combined demands of evaporation, plant growth, and stream flow. These demands are inexorable, and it is the ground storage which is called upon to supply them when rain fails to come." (Vermeule.)

"All of these ways of disposing of the rain which falls upon the earth may be classed as either evaporation or stream flow. Evaporation we make to include direct evaporation from the surface of the earth, or from water surfaces, and also the water taken up by vegetation, most of which is transpired as vapour, but a portion of which is taken permanently into the organisms of the plants. Stream flow includes the water which passes directly over the surface to the stream and also that which is temporarily absorbed by the earth to be slowly discharged into the streams. A portion, usually extremely small, passes downward into the earth and appears neither as evaporation nor as stream flow. It is usually too small to be considered, and we may for our purposes assume that all the rain which falls upon a given watershed and does not go off as stream flow is evaporated, using the latter word in the broadened sense which we have above described."—(Vermeule.)

Important as the underground waters may be, we are at present more particularly interested and concerned in the surface water of our country, that valuable natural resource, the tremendous importance of which has only recently been recognized by our Governments: water for domestic and municipal use, water for irrigation, water-power (the cheap white coal of modern industry), mining, logging, and navigation.

Within the last few years Governments have come forward and declared that water is a public resource vested in the Crown, and shall be used for the common good.

Having taken possession of this great resource, it behooves the Governments to administer it wisely and well. It is axiomatic that to do this, one of the first things is to take stock; see how much there is; where and how it is distributed; and how it can be most beneficially used and conserved.

The methods of the United States Hydrographic Survey are undoubtedly the most modern and approved for measuring and determining the quantity of water flowing in a stream from the largest river to the smallest ditch at any instant, during any day, month or year, whether in terms of the unit of flow (second-feet) or the unit of quantity (cubic feet or acre-feet).

It is not the intention to discuss these methods in this report, but merely to outline how they were made to apply to the hydrographic survey work in the Railway Belt and the peculiar conditions encountered in that district.

METHODS OF MEASURING STREAM FLOW.

(1) By the slope method (with Kutter's or Chezy's formula).
(2) By weirs.
(3) Area and velocity method.
- (*a*) Float measurement of velocity.
- (*b*) Current meter measurement of velocity.

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(1) The slope measurement was rarely used by the Hydrographic Survey, and then only as a check on current meter measurements of large streams at the extreme flood period, when the velocity was very high.

(2) The weir method may be used conveniently for measuring the flow in small irrigation ditches and flumes. For the flashy mountain streams of British Columbia, it is unsatisfactory, as the flood flow is often twenty-five to fifty times greater than the low summer flow, and there is also danger of the weir being washed away.

The different kinds of weirs and their formulæ may be found in any text book or Engineer's manual.

In Bulletin No. 11, British Columbia Department of Agriculture, Professor Etcheverry gives an excellent discussion on weirs (especially the Cippoletti weir), and other measuring devices for use in irrigation canals and ditches. This article should be of great value to the irrigating farmer.

(3*a*) Float measurements were taken when only a rough estimate of discharge was desired. This method can be easily used by the layman who wishes to obtain an approximate idea of the flow of any river or stream.

In a small pamphlet compiled by the Commission of Conservation (A. V. White), entitled "Instructions relating to the gathering of certain preliminary information respecting water-powers" the float method is discussed and a valuable table is appended for the determination of the co-efficient to apply to the surface velocity. This co-efficient (K) ranges from ·70 to ·90, varying inversely with the surface velocity, directly with the depth of the water, inversely with the material forming the bed of the channel, and inversely with the width of the stream. This table is reprinted here.

FLOAT MEASUREMENTS.

The following table will serve as a rough guide in the determination of the most probable co-efficient (K). Interpolate for conditions not given in the table.

Velocity. (Feet per Second).	Average Depth. (Feet).	Size of Material on Bottom. (Feet).	Co-efficient. (K.)
2 or less	2 or less	½ or less	·80 to ·85.
2 "	2 "	1	·75 to ·80.
5	2 "	½	·80.
5	2 "	1	·75.
10 or more	2 "	½	·75.
10 or more	2 "	1	·70.
2 or less	5	½ or less	·85 to ·90.
2 "	5	1	·85.
2 "	5	3 or more	·85.
5	5	½ or less	·85.
5	5	1	·85.
5	5	3 or more	·80 to ·85.
10 or more	5	½ or less	·80 to ·85.
10 "	5	1	·80.
10 "	5	3 or more	·80.
2 or less	15	½	·90.
2 "	15	1	·90.
2 "	15	3 or more	·90.
5	15	½	·90.
5	15	1	·90.
5	15	3 or more	·85 to ·90.
10 or more	15	½	·90.
10 "	15	1	·85 to ·90
10 "	15	3 or more	·85 to ·90.

The co-efficient close to abutments or piers usually lies between 0·9 and unity, and is sometimes greater than unity.

CURRENT METER MEASUREMENTS.

(3 b) Nearly all the measurements of stream flow were made by means of a current meter. The instrument universally adopted by the Railway Belt Hydrographic Survey is the small Price electric meter, made by Gurley & Co., and called "No. 621" in their catalogue. This meter registers either every revolution or every fifth revolution (single head or penta head) by means of an electric contact, the sound being transmitted to the observer by means of telephonic attachment. In most of the British Columbia streams the velocity is fairly fast, and the penta head commutator was used. A two-story carrying box was used for carrying the meter and accessories. This box is the design of the United States Hydrographic Survey and can be secured from the Gurley Co.

The meter may be attached to wading rods for taking measurements in shallow streams. Or it may be attached to a cable and suspended in the water by torpedo-shaped weights, while the hydrographer measures from a boat, a cable and car, or from a bridge.

Instead of the heavy double-insulated cable supplied by Gurley for suspending the meter in the water, the Railway Belt Hydrographic Survey manufactured a suspension cable of its own. This is a one-eighth-inch mild steel cable from which the manila core was removed and an insulated (magnet) wire inserted in its place. This gave the return circuit in a single wire, which has tremendous advantages over the old form of cable. It is of such small diameter that it offers less resistance to the current, and the meter is not carried so far down-stream. This gives better soundings and truer depths at which the observations are taken. Morever, less lead weights need be used, which makes the work easier for the hydrographer. It is advisable to cover the upper part of the cable with friction tape to give a better grip of the hands and also to prevent kindling.*

The great advantage of the small Price electric meter (No. 621) is that it can be used to measure a stream of any size, from the smallest ditch to the largest and swiftest river.

In general, measurements were made by the two point method (·2 and ·8), and sometimes by the three point. In very shallow streams, the ·6 depth alone was used. In the flood discharge of some large, swift rivers it was almost impossible to submerge the meter to the proper depth even by the use of a stay line. In such cases, surface measurements were made with the meter and the proper co-efficient applied.

Generally at a measurement sufficient observations were taken to total sixteen in the section. In very wide rivers many more were often taken.

It would be superfluous to enter here into a full description of the current meter, its use, and care, but the following little points were specially noticed by the hydrographers in the Railway Belt, and are given as a guide to inexperienced users of the small Price electric meter. Keep bearing point and parts oiled and clean to prevent rusting. Keep bearing point nicely adjusted. Keep lock nut of bearing point tightened. Keep all set-screws tight, particularly those controlling bearing point sleeve, and vanes. Keep platinum contact spring in commutator in adjustment so as to make a sharp contact but not to bear too heavily. Before each measurement, and frequently during a long measurement, test the meter head by spinning it in the air to see that it runs freely. A meter in good adjustment should run at least sixty seconds freely in the air. Test dry cell battery before each trip, and if it is getting weak, take a fresh one along. Always carry a spare bearing point, a spare platinum contact spring, and several set-screws.

* The single wire suspension of the electric current has been tested by the Railway Belt Hydrographic Survey, but has not yet been used in actual practice. The meter is suspended by a single wire or cable, and from the observer another wire is connected with the water which completes the circuit to the head of the meter.

RATING OF METERS.

Each meter must be rated in order to determine the relation between the revolutions of the cups and the velocity of the water at the point of observation. When the small Price electric meter is new, the United States composite rating table may be used. This rating table is based on the ratings of a large number of meters of the one pattern, and, it is believed, is more nearly correct than a single rating of any one meter. After one season's use the meters were rated at the Calgary rating station by the courtesy of the Commissioner of Irrigation. It was found that the individual ratings agreed very closely with the composite table. After the second season's service, in 1912, the meters were again rated at Calgary, and it was this time found that the meters were running with less friction than when new. Consequently, new rating tables were made for each meter.

GAUGING STATIONS.

The fundamental principle, or assumption, on which hydrographic determination of stream flow is based, is that the discharge is a function of the gauge height. Conditions being constant, the discharge is always the same for the same stage of river height; and for any stage the discharge can be determined by formula, generally a graphic one. This principle of stream flow holds approximately true so long as the conditions controlling the flow in the vicinity of the gauging station remain reasonably constant. For a complete discussion of this principle, see chapter 6, of 'River discharge' by Hoyt and Grover (1st edition).

In establishing a gauging station, the first thing to do is to carefully consider the object of the station, and what information the data, when obtained, will show. Sometimes it is desired to study the total flow of a stream at its mouth; or above or below a certain tributary; or at a proposed power site or intake; or perhaps, in connection with storage, it is desired to know the flow from or into a lake. With the object of the station in mind, a thorough reconnaissance of the vicinity should be made to obtain the best location for the gauging station. Now, a gauging station consists of two essential parts, viz., the gauge and the measuring section. Although not absolutely necessary, it is eminently desirable that the gauge and the measuring section should be at one and the same section. But a good measuring section is not always suitable for a gauge, and *vice versa*. If the two are not in the same section, an auxiliary gauge should always be placed in the measuring section, on which readings should be taken during meter measurements, and to which soundings, etc., are referred. This is necessary to determine any shifting of the bed or other changing conditions, and to project the area of the section for any stage.

A gauging station should generally be established at low water, but it has been the experience of this Hydrographic Survey that it is often more important to be familiar with the high-water conditions. This is especially so in the 'Dry Belt', where at the low stages it is almost impossible to appreciate the conditions that occur during the May freshet.

In the Railway Belt, the streams measured range from small irrigation streams that are mere trickles in the late summer and rushing torrents in the month of May, to large rivers like the Fraser, which has a maximum flood discharge of nearly 300,000 second-feet, and a velocity of 10 or 12 feet per second.

The choice of a gauging station on large rivers like the Fraser, Thompson and Columbia, depends mostly on the practicability of obtaining a satisfactory measuring section, and the cost of installing the necessary equipment for making the meter measurements. In some cases a good bridge is available, crossing at right angles over a section with uniform current; and when it is evident that conditions are fairly constant, a station is established easily and at small cost. Meter measurements are conveniently made at a bridge station, especially after the first measurement has been taken, with soundings (projected to high-water mark); a permanent initial point well marked; metering points plainly marked along the rail of the bridge; depths referred to the bridge rail, etc. (See bridge station on Columbia river at Revelstoke, Thompson river at Spences Bridge, and Thompson river at Kamloops.)

On large streams in British Columbia the conditions are fairly constant, and the beds are not liable to shift. On the other hand, the velocity at the flood period is often so swift that it is almost impossible to sink the meter to the desired depths. In such cases it is necessary to resort to measurements of surface velocities with the meter.

Where no suitable bridge is available, measurements from a boat are often made. (See station on Fraser river at Hope.) Here the river is 1,000 feet wide, and a cable station would be very expensive if not impracticable. A motor boat is anchored at various points in the section, and its distance from the initial point determined by means of a transit and measured base on the shore. In narrower rivers, a mild steel cable is stretched across, and a boat is moored thereto. The cable is generally tagged, and the meterings thus made at desired intervals. (See station on Fraser river at Lytton.)

Where a river is too swift or rough for a boat, it is often necessary to establish a cable station. This consists of a strong cable stretched across the river at the section, and a small car suspended from the cable in which the hydrographer sits, and makes the meterings at the desired distances. Where the initial cost is justified, a cable station is most satisfactory. (See station on Nahatlatch river.)

On streams not much over 100 feet wide, and which cannot be measured conveniently by wading, by a boat, or from a bridge, the hydrographers of the Railway Belt Hydrographic Survey stretch a light endless wire cable across the stream; then they operate their meter from the shore by means of ropes and pulleys. This method can be used satisfactorily only when the meter is suspended by a small cable with insulated core, as has been described hereinbefore. (See Current Meter Measurements.)

The establishment of stations on the small irrigation streams at first seems comparatively easy, especially at low-water stages; but it is on these streams that the greatest difficulties have been encountered. The stage is very low during the later summer and winter, in fact for nearly ten months of the year. The discharge during the spring freshet in May is often fifty or a hundred times greater than the flow in July or August. Consequently, the effect of this sudden rush of a large body of water is to disturb conditions near the gauging station so that a discharge curve already established is no longer applicable. Indeed, oftentimes the gauge is washed out, the banks torn away, and the whole channel altered almost beyond recognition. In establishing stations on these flashy streams at low water, a full knowledge should be gained of the flood conditions, and a place obtained where permanent bed and banks continue from year to year.

Note should also be made of any existing diversion canals above or below the station; the existence of artificial control by storage works; the existence of side channels at any stage; the possibility of underground channels or seepage near the station.

GAUGES AND GAUGE READERS.

The word "gauge" in hydrographic work signifies a graduated scale or other instrument for recording the stage and changes in stage of the water level of a stream or lake. A gauge may be recording or non-recording. Recording gauges on account of their mechanism are rather expensive, and at present are scarcely justifiable in ordinary stream-flow measurements. But on important streams, where the continuous fluctuation of the water level is desired, or where small fluctuations are of great importance, recording gauges should be installed. There are many designs of recording gauges now on the market: Stevens, Frieze, Gurley electric, Gurley simplex, Barrett and Lawrence hydrochronograph, Bristol, Welsh, Haskell, Watson, etc. These range in price from $50 to $200, exclusive of the cost of installation. Some recording gauges need attention each week, others will run continuously for a month. The Railway Belt Hydrographic Survey has not yet installed any recording gauges, but several are used by the large power companies.

The gauge in general use in the Railway Belt work is the ordinary vertical staff gauge. Most of the gauges set were 2-inch by 4-inch scantlings, planed smooth, and painted white. Each gauge was graduated in feet and tenths in black paint, and the whole varnished. These gauges, however, were soon affected by the water and scum, and became almost illegible. A metallic staff gauge has recently been adopted. It is made of enamelled iron, one-eighth-inch thick and three and one-half inches wide. It is in sections each three feet long. Each section is graduated in tenths, one reading from zero to three feet, the next from three to six feet, and so on. The graduations and the figures are in blue on a white ground. Each graduation, including the tenths, is numbered, so as to allow no probability of the gauge reader making a mistake. The average gauge reader seems to think that the tenths of a foot are inches, and where a gauge is numbered only at the integral feet, he is liable to count back from the first number that is visible above the water surface. For example, if the gauge really registers 4·7, the gauge reader will probably note that it is three graduation divisions below the 5-foot mark, and will record the height as 4·9, meaning 4 feet, 9 inches.

The enamelled iron gauge rods are screwed to a plank backing, to a bridge pier, or other convenient and permanent location. They have a smooth surface, are easily cleaned of scum and other deposit, and are very legible. They are cheap, portable and permanent.

For large rivers with great fluctuation of stage, special board gauges of the necessary length are painted in black and white.

Where vertical staff gauges could not be conveniently or satisfactorily placed, chain gauges were installed. A chain gauge is, briefly, a chain of known length with a weight at the lower end and a marker at the upper end. The chain passes over a pulley, and the weight is lowered until the lowest point of the weight just touches the surface of the water, forming a little V-shaped riffle as it comes in contact with the running water. The height of the surface is then registered either directly on the chain, if graduated, or by a graduated board on the hand rail of the bridge or other support of the gauge.

It should be noted that in all cases the zero of the gauge is placed at an arbitrary [illegible] and has no relation to the bottom of the stream or to zero flow. Therefore the gauge [illegible] registers the absolute depth of the water, but merely the height of the water surface above the arbitrary zero of the gauge. The difference between [illegible] gauge heights represents the rise or fall of the river in the section where the gauge is located.

The gauge should always be fastened securely so that there is no danger of its being washed away by floods, ice or logs; or of shifting even a trifle in elevation. In case of destruction or shifting, permanent bench-marks should always be established and referred to the datum of the gauge. If possible, also, the elevation of the datum should be referred to some point whose elevation above the sea is known, such as railway bench-marks, etc. The datum of the gauge should be checked each season. For establishing bench-marks a small light level is sufficient, as rarely are sights of over [illegible] or 75 feet necessary. A gauge should be checked to the nearest one-thousandth.

The zero of the gauge should be below the lowest level of the water at its minimum stage, so that negative readings should not be necessary.

A gauge should be placed in a spot where there is no backwater from other streams just below, or from a dam, gorge or other obstruction. The banks and bed should be permanent and unshifting; the banks should not overflow at high water; and there should be but one channel at all stages.

If the gauge is not in a sheltered location, it is sometimes necessary to place a stilling-box. This prevents erroneous readings from wave-action or splashing of the current against the gauge, particularly at high water.

The gauge is generally read by a neighbouring farmer or resident, readings being taken twice a day, daily, tri-weekly or weekly accordingly as circumstances permit, and the changes of stage warrant. The gauge readers are paid on an average $5 per month where daily readings are made and a distance of not more than ½ mile has to be travelled.

The gauge readers are supplied with a small book in which their readings are recorded. Each book holds three months' readings, and is sent to head office at the end of each quarter. Postal cards holding a week's readings are also supplied. The gauge readers mail these weekly, and the head office and the hydrographers are thus able to keep in touch with the stage of the stream and other circumstances of the station.

On the whole, gauge readers are fairly reliable; that is, they record accurately the readings they actually make, but are sometimes inclined to interpolate readings they have omitted. This is particularly so when a gauge reader becomes adept at reading and familiar with the behaviour of his stream. Women and girl readers generally give the best satisfaction.

MEASUREMENTS OF STREAM FLOW DURING THE FROZEN SEASON.

As soon as a stream freezes, either at the gauge or between the gauge and the control, the discharge ceases to be the same function of the gauge height that it is during open conditions, and separate investigations have to be made during the frozen season.

Meterings are easily made, generally through holes in the ice at regular distances, and they are as precise as ordinary open channel measurements. Care should be taken, however, to prevent the meter from freezing, by keeping it submerged in the water except when carrying it from hole to hole.

A record of the gauge height is made at the same time, through a hole cut in the ice at the gauge, the record comprising as well the thickness of the ice, and the depth of the water below the surface of the ice. A sketch should also be made showing how the ice conditions exist over the whole channel from the gauge to the control. A similar record and sketch should be taken by the gauge reader weekly or semi-weekly, together with records of the daily temperature, and notes regarding ice conditions, anchor ice, blocking or choking of the channel, and so forth.

By taking meterings about once a month, the daily discharge can be interpolated from the records of gauge heights and temperatures with a fair degree of accuracy.

Where there is a good control below the gauge, such as a pronounced fall or rapid, and open conditions continue at the control even when the channel is wholly or partly frozen at the gauge, the open channel curve can generally be applied, with perhaps a constant correction co-efficient. The applicability of the open curve should, however, be proven by several actual measurements in each case.

At the recent conference of district hydrographic engineers at Washington (January, 1913), Mr. W. G. Hoyt read a paper on 'Methods of estimating stream flow during frozen periods of the year, based upon discharge measurements, gauge heights, and a knowledge of climatic and ice conditions.' This paper embodies the latest experience and thought on the determination of winter flow, and an abstract is printed here, with due acknowledgment and thanks to Mr. Hoyt.

"Methods of estimating stream flow during frozen periods of the year, based upon discharge measurements, gauge heights, and a knowledge of climatic and ice conditions.

"When the temperature falls below freezing, numerous conditions affecting stream flow are liable to be produced, which tend to destroy the otherwise fairly constant relation between stage and discharge, thus making it necessary to employ special methods to arrive at the true discharge.

"Measurements of discharge which indicate the flow at the time they are taken, are fundamental in any method for winter estimates. The accuracy of the results will depend largely on the frequency of the measurements, and, in connection with records of gauge heights, temperature, precipitation, and ice conditions, they form the basis for estimates of flow.

"Precipitation is the cause of all run-off, and since temperature is the controlling factor in regulating the rate at which winter precipitation reaches the streams, it follows that temperature is, in general, the most important governing factor and should be given special consideration in making winter estimates of run-off.

"Estimates of stream flow under winter conditions may be made by the following methods:—

"1. By the application of the gauge heights of the water surface to the open water rating, when it is known that the controlling point for the gauge is clear of ice and that no backwater exists at the gauge.

"2. By developing a curve based on discharge measurements and gauge heights to the water surface to which is applied directly the open water gauge heights as taken by the observer.

"3. Basing the flow directly upon discharge measurements, taking into account the climatic and ice conditions.

"(*a*) By the eye method, working directly with the daily discharge, varying it between times of measurement by inspection of the temperature and precipitation records and gauge heights, and adjusting by comparison of results for nearby stations.

"(*b*) By applying the open water rating to the gauge heights and applying to these discharges a co-efficient as determined at times of measurements, varying the co-efficient according to a knowledge of temperature, precipitation, and ice conditions.

"(*c*) By the graphic method, plotting the records of temperature, precipitation with the gauge heights to water surface and determining the amount of correction necessary to apply to the gauge heights in order that the open water rating table may be used, basing the variation in this correction between times of measurements directly on the variations in gauge heights and temperature conditions and modifying the same by records of precipitation and ice conditions.

"The accuracy of method No. 1 depends primarily upon the location of the station. Stations are now located at several points in the United States and Canada at which this method is giving excellent results, but as their number is few, the method can only be used in special cases.

"The accuracy of method No. 2 will depend largely upon the number of discharge measurements and their conformity to a true curve. It is believed that this method can be used at a smaller number of stations than can method No. 1.

"Method No. 3 will apply at practically all gauging stations which are affected by ice conditions. It may be a matter of opinion as to which of the three different practices, (a), (b) and (c) of No. 3, will give the best results. Method 3 (a) is the one now commonly used. Methods 3 (b) and 3 (c) will, it is believed, give better results than method 3 (a), with method 3 (c) possibly having an advantage over either of the other methods.

"A discharge measurement taken under ice conditions, when plotted to the open water gauge height, will plot either on the open water curve or to the left, showing that the disturbing conditions result in a backwater effect. Therefore to arrive at the true flow for a given gauge height it is only necessary to determine the magnitude of this backwater effect at the gauge. In general the amount of backwater varies directly with climatic conditions. Having determined accurately the amount of backwater at stated intervals by discharge measurements, it is possible to determine the backwater effect between times of measurement by constructing a curve of backwater which can be drawn by following the gauge heights and the climatic and other conditions which cause the backwater.

"By plotting the daily gauge heights and the backwater curve at the same scale, the corrected gauge heights can be taken off graphically, thus saving considerable time.

"In connection with this study, I wish to advance the following tentative conclusions, based upon observations of conditions in Minnesota since the fall of 1911:—

"1. That ice conditions are apt to cause backwater at the gauge.

"2. That backwater increases rapidly at the beginning of each cold period, partially dropping off later.

"3. That the amount of backwater will tend to vary with the temperature.

"4. That stream flow will drop off suddenly, following a cold period, to be partially regained later.

"5. That stream flow is apt to decrease when temperatures go below 32 degrees, but that the flow tends to increase with any rise in temperature, especially when the minimum temperature goes above 32 degrees F.

"6. That having snow cover on ice may cause increased backwater.

"7. That flow may increase without a raise in gauge height due to the wearing away of the ice.

"Respectfully submitted,

"W. G. HOYT,

"District Engineer, U.S. Hydrographic Survey.

"ST. PAUL, MINN., January, 1913."

PRECIPITATION IN THE RAILWAY BELT AND ITS RELATION TO RUN-OFF.

The primary source of water supply is rainfall, the chief source of which in British Columbia is evaporation from the Pacific ocean.

Brought from the Pacific by the westerly winds, warm and moist by the influence of the Japan current, the moisture in the air is carried easterly across the province in quantities varying at different times of the year.

Now, all air holds a certain amount of moisture, ranging from the amount sufficient to saturate it to a very small proportion of that quantity. The point of saturation is much higher in warm air than in cold air, that is, warm air can hold a much larger quantity of moisture than can cold air. Whenever air is cooled below the point of saturation, rain falls, and it can only fall when thus chilled.

There are several ways in which air currents may be cooled; the current may be forced upward as when it climbs the slope of a mountain range; it may be cooled by intermingling with colder air currents; and again, by coming in contact with cold land. The sea receives heat slowly and parts with it slowly; the land, on the contrary, is rapidly heated and parts with its heat as quickly. It results from these conditions that the ocean has a fairly uniform temperature the year round, while the land is much colder in winter than in summer.

The west winds come off the Pacific laden with moisture and having the temperature of the ocean. If they encounter land having a lower temperature they are chilled below the point of saturation and some of the moisture is deposited in the form of rain or snow. If, on the other hand, the land is warmer than the air, the air currents pass over it without any reduction in temperature and with little or no loss of moisture.

During the autumn and winter, the Pacific coast is colder than the sea, and hence the copious precipitation which it enjoys at that season of the year. In the summer the conditions are reversed, and the air currents, although containing at least as much moisture as in cold weather, pass over the land with less loss by precipitation.

In the vicinity of Vancouver there are also local conditions affecting the quantity of precipitation, viz.: certain fairly high mountains, which cool the moist air currents and cause abnormal rainfall. This quantity diminish advancing inland from Vancouver, owing to the upward diversion of the moisture-laden winds, and the lower elevation of the hills, until about 100 miles from the coast the precipitation is so small that an arid district has resulted.

This arid strip is nearly 100 miles in width, and is commonly called the 'Dry Belt' of British Columbia. After passing over this belt, higher mountains are again met and they cool the air, consequently the precipitation in the vicinity of the Selkirk mountains is abnormally large.

In the upper Columbia valley, from Golden to lake Windermere, there is also another arid, or semi-arid district, lying between the Selkirks and the main range of the Rockies. The winds pass from one high range to the other depositing only from 10 inches to 20 inches of precipitation per annum in the valley.

The precipitation in the main range of the Rockies is large (from 60 inches to 100 inches), but not as great as in the Selkirks.

The following is an extract from the *Monthly Weather Review* of the Meteorological Service:—

> 'British Columbia is a territory with very pronounced geographic features, several lofty chains of mountains paralleling the coast from the extreme north to the most southerly boundary. Along the exposed western coast the precipitation is over 100 inches, and eastward over Vancouver island and the mainland the western slopes of the various ranges each claim a much larger percentage of moisture from the Pacific winds than do the valleys and the interior plateaus. Near the more eastern shores of Vancouver island, the annual precipitation ranges between 35 and 50 inches, while across the strait of Georgia in the valley of the lower Fraser, it is generally from 50 to 60 inches. Eastward of the coast ranges the climate of Yale, Kamloops, and the Okanagan district is decidedly drier and the annual precipitation is from 5 inches to 20 inches according to geographic situation. Approaching the Selkirk range the precipitation increases, and at the higher altitudes is very great, chiefly owing to a heavy snowfall between October and April.'

The data of precipitation in British Columbia, as in the other provinces, are derived mostly from the records of the Dominion Meteorological Service, which is a branch of the Department of Marine and Fisheries. The Meteorological Service has its headquarters in Toronto, under the direction of Mr. R. F. Stupart, F.R.S.C. It was organized in 1870, since which time it has carried on extensive observations over nearly the whole of Canada, recording precipitation (rain and snowfall) temperature, pressure, sunshine, wind velocity, etc. In British Columbia, the chief of the Meteorological Service is Mr. E. Baynes-Reed, with headquarters at Victoria. Numerous observation stations have been installed at various places throughout the province, the necessary instruments and equipment being supplied by the Service, and the observations made in some cases by paid, and in others by volunteer, observers. As may be expected, the records of observations are not all complete, but they give a fairly accurate knowledge of meteorological conditions, at least in the settled portions of the province in the main valleys.

The precipitation data obtained by the Meteorological Service has been, with few exceptions, by means of a standard cylindrical rain gauge, the cross-sectional area of which is 10 square inches, the depth of rain being determined by dividing the cubic contents daily by ten. Each gauge is placed in a position as near the surface of the ground as possible, so that the mouth of the gauge is about one foot above the level. The mouth is kept strictly level, and its position such that it is sufficiently removed from any building, tree or other objects that might interfere with the free access of rain, even when it falls with considerable obliquity.

No snow gauge has yet been used, the method of transferring snowfall into precipitation being to assume that on an average 10 inches of snow are equivalent to 1 inch of water.

For hydrographic purposes, precipitation data are extremely valuable. But while it is true that the run-off of any stream is partly a function of the rainfall, it is also so influenced by other incidental and secondary considerations, that a definite relation between rainfall and run-off is almost indeterminate. Let us consider, for example, a small stream discharging from a small uniform drainage area. It would be reasonable to suppose that the largest total run-off of the stream during any year would be the year of greatest rainfall, and similarly for the smallest. But when it comes to establishing a definite relation between run-off and the precipitation, in successive years we find that it depends on various circumstances, such as the distribution of the rainfall—whether during the growing, replenishing or storing periods; the rigour of the winter, the warmth of the summer, the earliness of the spring; and even how the winter set in—whether the frost came before or after the snow, and so on.

It is with extreme caution only that precipitation data can be used for determining the run-off of a stream of one drainage area by comparisons with the known run-off of a stream of a neighbouring drainage. Every stream is a law unto itself, the run-off being influenced by many complex elements, such as geological formation of catchment area, topography, forests, lakes, evaporation, etc.

On the other hand, by using careful judgment and all available data, very close deductions can be made. If we have good hydrographic measurements of the run-off of one stream, and know its drainage area, and the amount of precipitation, we can deduce a fairly reliable run-off for a neighbouring stream, knowing its drainage area and precipitation, especially if we have a few meterings to corroborate our deductions.

Unfortunately, the precipitation data available in British Columbia are insufficient for hydrographic purposes. The rain gauges are nearly all located in the settled communities, in the valleys mostly, and we have no well-distributed records in the higher reaches of the watersheds. High up in hills and mountains the rain and snowfall are as yet unknown quantities, our best deductions and formulæ being unsubstantiated. Consequently, the precipitation recorded near the mouth of a stream is rarely representative of the mean precipitation over the whole drainage, and great care should be exercised in drawing conclusions from our limited data.

The mean rainfall given in this report for any stream on drainage area is merely an approximation, deduced with the assistance of the limited precipitation records and our intimate knowledge of meteorological conditions. We have attempted to deduce a relationship between the measured run-off and the approximate precipitation and these deductions may be of some service to engineers and others, remembering always that our deductions are only approximations, and are not extended over a sufficient period of time to be reliable.

It will be noted that the depth of the run-off in inches, as shown in the tabulated records of run-off in some cases almost equals or even exceeds the estimated precipitation. This discrepancy is due to two sources of error in the base data used in these computations. In the first place, the drainage areas are by no means accurate, as has been previously stated. In the second place, the estimated precipitation over the drainage area is probably too small. As has been said, the precipitation stations are mostly in the valleys, and we have no records of or means of determining the enormous precipitation in the higher elevations of the watersheds. This is particularly true in such districts as Stave Lake, Lillooet River, and other watersheds near the coast, where the precipitation probably is 150 or even 200 inches. Again, in the Selkirks and main Rockies, the amount of annual snowfall is enormous, and the streams also derive much of their discharge from glaciers. The relation between the run-off and the indeterminate precipitation cannot be even approximately deduced at present.

Attention is called to a paper read before the sixth annual convention of the Western Canada Irrigation Convention, at Kelowna, B.C., 1912, entitled 'Some climatic factors influencing the use and duty of water,' by R. M. Winslow, Provincial Horticulturist of British Columbia, and published in the proceedings of that convention by the Department of the Interior.

Also to bulletin No. 27 on "The Climate of British Columbia," published by the British Columbia Bureau of Provincial Information.

The precipitation records herein appended are mostly by courtesy of the Dominion Meteorological Service. The records of Jones lake and Lillooet lake are from Messrs. Anderson and Warden, C.E., Vancouver. The Stave lake data are from the records of the Western Canada Power Co. The records of lake Buntzen and Coquitlam lake are by the Vancouver Power Co.

The total yearly precipitation (rain and snow) have been compiled for all precipitation stations whose records are available, some of them extending back to 1891. The monthly precipitation for the years 1911 and 1912 is also given in tabulated form, these being the years during which the Railway Belt Hydrographic Survey has been in operation.

MONTHLY PRECIPITATION for 1911. Precipitation is shown in inches.

Precipitation Station.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Agassiz..........	4·9	3·6	2·7	2·5	6·6	1·6	1·1	3·0	4·0	3·7	9·1	7·7	51·4
Buntzen Lake....	10·1	6·4	9·4	2·3	9·2	3·0	1·0	1·4	10·1	2·6	20·4	21·6	97·5
Chilliwack.......	9·8	2·8	3·5	2·7	3·6	1·3	1·3	2·1	5·0	1·4	12·9	7·5	53·9
Coquitlam (Jct.)	7·5	4·2	5·1	1·8	5·6	1·8	0·4	1·0	7·0	1·9	12·3	9·7	58·9
Coquitlam Lake.	21·6	10·1	9·7	5·6	9·6	4·3	1·4	2·2	9·5	5·4	29·5	23·0	131·9
Enderby.........	2·4	1·4	0·9	0·4	1·5	1·4	2·1	1·7	1·7	0·2	6·1	3·3	23·1
Glacier	12·9	4·5	7·8	4·1	3·5	2·0	3·5	2·5	2·4	0·2	12·0	8·5	63·9
Gol[illegible]	4·6	1·8	0·5	0·4	2·5	1·7	1·2	1·3	0·0	1·2	3·3	1·3	19·8
H[illegible]	7·0	3·2	2·8	1·9	2·4	0·7	0·4	3·4	6·2	1·3	12·5	6·1	47·9
Jones Lake.......	....	....	....	4·2	6·4	2·7	3·3	3·1	10·1	2·1	17·5	7·8	....
Kamloops.......	0·5	0·2	0·1	0·1	1·2	0·2	0·8	1·0	0·9	0·0	2·0	1·3	8·3
Ladner..........	3·0	2·2	1·9	1·0	5·6	1·1	0·9	0·6	3·0	2·7	7·9	8·0	37·9
Lillooet Lake....	....	....	....	....	....	....	....	....	8·4	2·8	18·7	13·1	....
Monte Creek.....	0·4	0·1	0·3	0·3	0·1	0·1	0·5	1·1	1·3	0·0	1·9	1·8	7·9
New Westminster	5·4	3·2	3·3	2·3	5·3	2·2	0·7	1·2	4·2	1·9	11·6	9·3	50·6
Nicola Lake.....	1·5	0·4	0·1	0·3	0·9	0·5	0·3	1·5	1·2	0·3	2·5	1·3	10·8
N. Nicomen.....	8·2	3·7	5·1	3·0	5·2	1·5	1·6	2·4	7·2	1·8	15·5	9·1	64·3
Revelstoke......	7·5	3·3	3·0	0·8	2·6	2·1	2·6	1·6	22·6	0·5	5·1	4·3	36·0
Salmon Arm...	3·4	1·3	0·9	0·7	1·4	1·0	1·8	1·4	1·1	0·2	4·0	4·2	21·4
Stevenston.......	3·7	1·7	1·1	1·5	3·5	1·3	0·5	0·8	2·7	1·2	5·9	5·5	29·4
Stave Falls......	9·8	2·7	6·3	2·6	7·3	1·6	2·0	2·8	7·6	2·6	17·8	10·7	73·8
Tranquille.......	·0	·0	0·2	0·1	1·3	0·1	0·4	1·6	·0	·0	1·9	0·9	6·5
Vancouver... ...	6·1	3·4	3·1	2·0	5·4	2·1	0·9	1·2	4·4	2·2	12·7	8·8	52·3
Vernon (Coldstream Ranch)	1·4	0·9	0·7	0·5	1·7	1·7	1·3	1·4	0·9	0·1	4·1	2·5	17·2
Wilmer..........	2·1	0·4	0·9	0·3	1·7	1·9	0·7	1·7	·0	0·4	1·1	0·3	11·5

MONTHLY PRECIPITATION for 1912.

Precipitation Station.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Agassiz....	4·3	10·6	2·0	4·3	4·0	5·9	5·1	7·8	2·5	7·3	13·8	10·1	77·7
Armstrong..	2·6	1·4	0·1	1·2	0·5	1·9	1·9	1·4	0·9	1·8	3·3	2·5	19·5
Ashcroft.....	.....	.....	.....	.....	.....	.....	.....	.....	0·5	0·7	0·5	0·4	.....
Buntzen Lake.	15·9	10·1	3·0	6·7	3·2	4·6	2·6	8·2	4·7	11·4	19·1	19·0	108·5
Chilliwack........	...	5·4	1·1	2·1	1·5	2·2	2·2	5·1	1·2	6·7	10·8	7·1	50·0
												(. pp	rox.)
Coquitlam (Jct.)	.....	6·2	1·1	4·3	2·5	2·4	2·0	5·5	2·7	5·8	11·5	11·3	62·0
											(app	rox.)	
Coquitlam Lake.	21·7	15·5	2·1	10·	3·7	5·6	2·7	9·5	6·7	13·6	29·3	26·7	.....
Enderby.........	3·2	1·2	.....	.....	.....	0·9	2·2	1·3	1·0	1·4	2·0	2·4	147·1
Glacier...........	7·9	7·8	1·2	1·7	1·7	2·5	4·3	8·6	2·3	5·3	10·9	5·4	59·6
Golden	1·9	0·4	0·1	0·8	0·7	1·3	2·8	3·9	1·0	0·7	2·1	1·8	17·5
Hope............	6·4	5·1	1·1	10·4	0·7	1·7	2·8	4·1	0·7	6·6	10·2	3·9	53·7
Jones Lake......	8·8	8·7	2·4	2·9	3·9	4·4	5·9	7·0	2·1	11·7	24·3	17·3	99·4
Kamloops	1·2	0·6	·0	1·4	0·3	1·5	3·5	2·1	0·9	0·7	0·8	0·5	13·5
Ladner.........	4·7	3 8	0·3	1·8	0·9	2·0	1·9	3·2	1·8	4·1	5·5	4·8	34·8
Lillooet Lake....	11·5	9·7	1·6	6·2	3·9	4·3	3·0	8·0	.....	.....	.....	.....	91·2
												(app	rox.)
Monte Creek. ...	1·4	0·1	·0	1·5	0·3	0·7	2·0	1·3	1·1	0·8	0·8	0·6	10·6
New Westminster	8·3	6·0	0·6	·43	2·3	2·8	1·8	6·3	2·1	6·0	8·3	8·5	57·3
Nicola Lake.....	1·2	0·8	0·1	1·5	0·8	0·9	1·6	2·0	1·0	1·1	1·2	0·5	12·7
Nicomen.........	10·1	6·2	1·1	3·2	2·1	2·9	2·8	6·6	1·3	6·9	13·2	8·5	64·9
Revelstoke......	5·2	3·3	0·8	1·9	1·9	2·3	4·1	4·0	1·5	5·0	6·0	8·2	44·2
Salmon Arm.....	2·8	1·2	·0	1·3	0·5	·09	2·1	2·5	1·0	1·0	2·2	2·0	17·5
Steveston........	5·5	3·3	0·4	2·4	2·2	1·5	1·6	4·5	2·0	4·2	6·2	5·4	39·2
Stave Falls......	6·9	6·7	1·7	2·9	2·6	3·3	3·9	6·2	2·2	7·7	13·6	10·0	67·7
Tranquille.......	0·7	0·4	·0	1·2	0·5	0·7	2·4	2·3	0·7	0·2	0·1	.....	9·2
												(app	rox.)
Vancouver.......	8·5	6·2	0·9	3·0	2·3	2·3	1·5	5·9	2·8	4·6	9·2	8·8	56·0
Vernon (Cold-stream Ranch)	2·4	0·9	·0	1·1	0·8	1·3	2·6	1·2	0·7	1·2	1·4	1·2	14·8
Wilmer..........	1·1	0·1	·0	0·3	1·1	1·7	3·9	1·5	1·3	0·7	0·9	0·5	13·1

ANNUAL PRECIPITATION at various Precipitation

Precipitation Station.	Elev Feet.	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901
Abbotsford	50	68·6	55·5	67·8	71·5	56·2	56·2	57·9	50·3	65·0	Abandoned	
Agassiz	52		67·8	80 0	68·0	50·9	68·2	60·1	50·2	69·0	70·0	53·0
Armstrong	1,200											
Ashcroft	1,000											
Buntzen Lake	400											
Chilliwack	21											
Coquitlam Jct.	34											
Coquitlam Lake	450											
Enderby	1,180				19·3	20·6	18·5	21·9	24·0	28·0	22·5	
Glacier	4,07				58 6	55.7	56.0					
Golden	2,556											
Hope	500											
Jones Lake	1,900											
Kamloops	1,245					9·5	11·5	12·7	9·8	11·6	10·8	7·1
Langley	60						66·7	61·8	54·2	67·9	Abandoned	
Ladner	30								29·2			
Lillooet Lake	370											
Monte Creek	1,160											
Nicola Lake	2,120	11·1	10·8	11·4	8·1	9·3	10·6	13·3	9·6	14·5	14·4	9·1
N. Nicomen	59			90·1	96·8	77·6		74·5	71·9	81·5	84·3	74·2
Revelstoke	1,476									46·6		
Salmon Arm	1,152				12·9	16·9	16·6					
Spences Bridge	770	8·9	7·9	8·9	13 5	7·9	5 5	Abandoned).				
Steveston	20											
Stave Falls	200											
Tranquille	1,120											
Vancouver	136										71·5	
Vernon (Coldstream)	1,246						12·5		9·7			
New Westminster	330					41·7	46·2	55 0	54 9		69·2	63·5
Wilmer	2,700											

NOTE. Precipitation is shown in inches and includes rain and snowfall, 10 inches of snow assumed equivalent to 1 inch of rain.

* Approximately.

Stations in the Railway Belt, British Columbia.

1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	Mean	Remarks.
											61·0	Mean of 9 years.
54·7	57·7	54·7	60·6	64·9	61·7	47·5	63·7	57·0	51·4	77·7	61·4	" 21 "
										19·5	19·5	1 year only.
												Established 1912
	121·4	109·3	116·1	137·6	106·6	112·2	105·8	114·5	98·6	108·8	113·1	Mean of 10 years.
									53·9	45·0	49·5	" 2 "
77·5	74·7	75·6	66·1	75·7	70·4	72·7		75·9	58·9	62·0	71·0	" 10 "
	146·2	156·6	144·5	189·9	147·2	170·8	159·9	159·6	132·0	147·1	155·4	" 10 "
								21·4	23·1		22·1	" 9 "
48·6						65·0	*60·0	70·2	63·9	59·6	59·7	" 9 "
							21·5	21·0	19·8	17·5	20·0	" 4 "
								53·4	47·9	53·7	51·7	" 3 "
										99·4	99·4	" 1 "
12·0	10·8	10·8	8·4	11·1	8·9	7·5	9·6	7·7	8·3	13·5	10·1	" 18 "
											62·6	" 4 "
35·2			37·7		35·3	39·6	35·3	34·5	37·9	34·8	35·5	" 9 "
										91·2	91·2	" 1 "
								10·3	7·9	10·6	9·6	" 3 "
13·4	14·0	10·9	10·3	10·7	12·5	7·5	10·3	10·1	10·8	12·7	11·1	" 22 "
72·2	81·5	70·6	67·1	70·1	64·7	63·7	74·9	86·3	64·3	64·9	75·3	" 19 "
			37·4	40·2	49·1	42·9	41·1	46·2	36·0	44·2	42·6	" 9 "
					21·8	15·6	21·5	18·4	21·4	17·5	18·1	" 9 "
											8·8	" 6 "
							33·1	38·1	29·4	39·2	34·9	" 4 "
								90·6	73·8	67·7	77·4	" 3 "
								4·7	65·	*9·2	6·8	" 3 "
65·3.	60·6			58·0	57·6	62·7	59·5	59·4	52·3	56·0	60·2	" 10 "
	18·0	11·0	13·0	14·9	18·6	10·4	14·0	15·3	17·2	14·8	14·1	" 12 "
63·2	57·6	59·1	53·4	59·2	55·3	57·7	59·1	60·7	50·6	57·3	56·7	" 17 "
							*11·0	8·0	11·5	13·1	10·9	" 4 "

Smith-Curtis Irrigation Project, Savona.

DRAINAGE AREAS.

The drainage areas of streams in the Railway Belt have been determined from the best available maps; but in many cases cannot be considered very reliable, as often the only map obtainable was not designed with the intention of showing the mountains and contours with sufficient accuracy to delineate the watershed.

The principal maps used have been: The Dominion sectional sheets (3 miles to an inch); Wheeler's maps of the Selkirks and Rockies; and the Geological Survey map (1895) of the Dry Belt, showing contours.

For the larger rivers, such as the Fraser, Thompson, Columbia, and those that rise in the province and only pass through the Railway Belt, it was necessary to resort to the best provincial maps, most of which are on a very small scale.

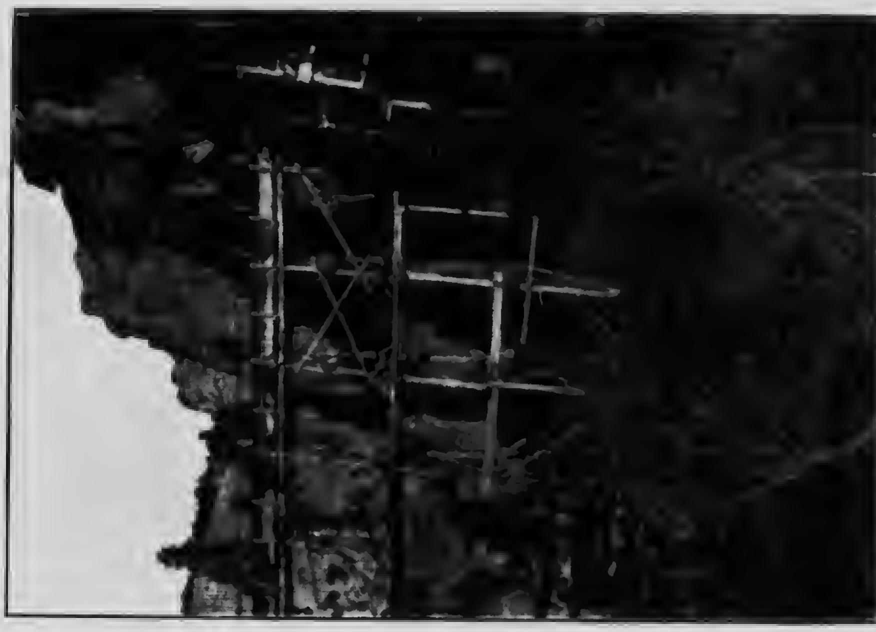
The computations in all cases were done with a planimeter.

Smith-Curtis Irrigation Project, Savona, B. C.

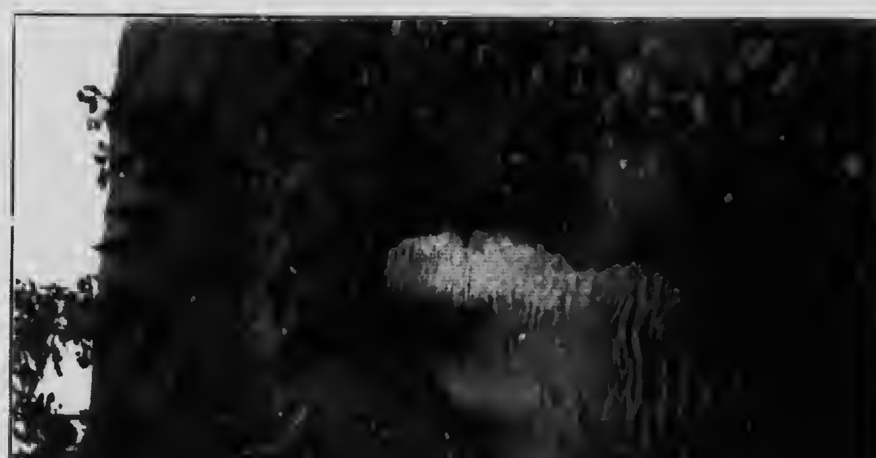
IRRIGATION IN THE DRY BELT.

The nature and extent of the "Dry Belt" of British Columbia have been already discussed herein under the heading "Hydrographic Districts in the Railway Belt," with particular reference to that portion of the dry or arid district lying within the confines of the Railway Belt. In this arid belt, about 100 miles wide east and west, the precipitation is only from 9 to 12 inches per annum, and irrigation must be practised for nearly all agriculture and horticulture. By irrigation is meant the artificial watering of crops whether by means of a garden hose or the most elaborate system of irrigation works; reservoirs, headgates, canals, flumes, ditches, laterals, etc.

As this report is essentially that of a hydrographic survey it purports to deal only with that branch of the science of irrigation which embraces the study of the available



Smith Curtis Irrigation Flume through Canyon, Deadman River near Savona, B.C.



Smith Curtis Irrigation Project, Earthern Ditch.

water supply, its use and conservation. When the Hydrographic Survey of the Railway Belt was inaugurated, after the Judicial Committee of the Privy Council had decided that the administration of water and water rights in the Belt was a Dominion responsibility, a commencement was made to form an efficient water administration and, as well, to study the whole science of irrigation, including those branches connected with the construction of works (reservoirs, dams, canals, distributing systems, etc.); the proper laying out of irrigation farms; and the beneficial application of the water to the crops and soil to insure the best and largest yield per unit of water and per acre of land. But, after the transfer of the administrative authority over water and water rights in the Railway Belt from the Dominion to the province, these latter branches of irrigation became more especially a provincial responsibility. Moreover, the practice of irrigation in the 'Dry Belt' has been extensively written upon and discussed in numerous provincial bulletins and reports, such as the report of the British Columbia Minister of Lands, 1912; Bulletin No. 44 of the British Columbia Department of Agriculture, etc., while the whole science of irrigation has been so exhaustively studied in the several arid states of the American union that almost the last word thereon can be found in the various books and pamphlets issued by the state and federal governments, particularly in the valuable publications of the United States Department of Agriculture.

It may be remarked, however, en passant, that irrigation as it is practised in the 'Dry Belt' of British Columbia can scarcely be called a science. Except in the case of the large and recently organized irrigation companies, the irrigation works are not of the most approved type; the losses of water in transmission are excessively large; the distributing systems are the evolution of expediency; only rude attempts have been made to lay out the lands for the proper application of the water; generally too much water is used; and it has been only by bitter experience that the farmers have learned what crops should be grown on certain soils and under certain conditions of subsoils, slope, elevation, exposure, climate, etc. If there is one district in Canada that needs a Government experimental farm it is the 'Dry Belt' or irrigation district of British Columbia.

THE DUTY OF WATER FOR IRRIGATION.

The duty of water is expressed by the area of land that a unit of water will irrigate.

This varies according to many circumstances: soil, subsoil, altitude, slope of land, drainage conditions, nature of crop, etc.; and also differs in different countries and localities.

Hence, it is almost impossible to state a definite duty of water for any large district, irrespective of the varied conditions. The following table will give some idea of the relative duties in many countries and states:—

Locality.	Duty per sec.-ft. (in acres).
Northern India	60 to 150
Italy	65 to 70
Colorado	80 to 120
Utah	60 to 120
Montana	80 to 100
Idaho	60 to 80
New Mexico	100 to 150
Southern Arizona	100 to 150
San Joaquin Valley (California)	100 to 150
Southern California	150 to 300
Southern Alberta	.. 150

In the 'Dry Belt' of British Columbia, the soil is mostly a light sandy loam with a sandy or gravelly subsoil, and the irrigable land requires a good supply of water.

The elevation varies from 800 to 2,500 feet above the sea. The bench lands, on which most of the fruit is grown, are of this kind. Owing to the slope and the nature of the subsoil, the drainage is good, and there is little possibility of alkali, or of souring the land. The bottom lands are mostly sandy also, with some clay, black loam or humus. These lands are used for hay, grain or mixed farming, but unfortunately some valuable tracts have been temporarily spoiled by too much water, resulting in deposits of alkali.

These, of course, are general statements, and do not include all the varied conditions of soil and crops. A conservative estimate of the duty of water for the British Columbia dry belt is as follows:—

Crop.	Acre-feet of water in an irrigating season.
Hay and fodder	$2\frac{1}{2}$ to 3
Grain and root crops	2 to $2\frac{1}{2}$
Fruit	$1\frac{1}{2}$ to 2

These quantities of water indicate the amount of water actually applied to the land and crops. There is a goodly percentage of water lost in transmission, etc., between the diversion from the source of supply and the actual irrigation. Hence, in all calculations for the amount of water that must be taken from a stream or reservoir to irrigate a certain acreage of land in a certain crop, allowance must be made for all losses.

It is not proposed to enter into a lengthy dissertation on the duty of water. It is a question that must receive much future study in British Columbia, and he would be dogmatic indeed who would attempt to fix a law at the present time. Many interesting and valuable pamphlets and articles have been written on the subject by irrigationists and engineers, all of which assist to throw some light on the subject. Reference should be made to these by anyone interested.

The following publications on the duty of water are recommended:—

A paper in the "Eighth Biennial Report of State Engineer of Idaho" (Boise, Idaho, U.S.A.).

Circular No. 108, by Frank Adams, of the United States Department of Agriculture; office of Experiment Stations.

Bulletin No. 172, by S. Fortier, of the United States Department of Agriculture; office of Experiment Stations.

Bulletin No. 44, British Columbia Department of Agriculture (B. A. Etcheverry), with special reference to British Columbia.

STORAGE AND STORAGE WORKS.

Storage reservoirs are essential to the beneficial conservation and regulation of the run-off of nearly all streams, whether in a humid or arid district. For water-power projects efficient storage is important to increase the natural minimum flow. In British Columbia, the majority of streams on which power can be developed have excellent natural storage lakes situated above the power sites. For example, Coquitlam lake, Stave lake, Lillooet lake, Chehalis lake, Jones lake, Adams lake, Barrier lake, and Mabel lake. And in nearly every case a good dam site is obtainable, where a dam can be constructed almost to any desired height, and the greater portion of the flood flow conserved and stored for the low-water period.

The construction of a large storage dam for power purposes is an important engineering feat, the particular kind of dam depending on the circumstances. Probably the most interesting dam in British Columbia is the hydraulic earth-fill dam now under construction by the Vancouver Power Company at the outlet of Coquitlam lake.

Cherry Creek Estate, Irrigation Storage Dam.

Cherry Creek Estate, Irrigation Dam.

This dam is about 850 feet long at its crest and 40 feet wide. It will have an extreme height of 98 feet. It will raise the level of Coquitlam lake 60 feet and will give the lake a storage capacity of 175,600 acre-feet. For a complete description of this dam, and the Coquitlam-Buntzen Hydro-electric Power Development, see the *Canadian Engineer* for October 10, 1912.

For the irrigation of arid lands storage is very important. In fact, it may be said that the storage of the surplus waters of the spring freshet is probably the solution of the present water scarcity, and on such conservation depends the future development of the 'Dry Belt.' Whether the storage works are constructed by the government, by large irrigation companies, by the co-operation of irrigators, or by individual farmers, every encouragement should be given by the Government to further this

Flume of the Barnes Canal (Looking up Deadman River).

important work. All storage sites should be investigated by Government engineers. They should be surveyed and contoured, and their capacity calculated. The best dam site should be carefully chosen, and the nature and cost of the most suitable dam determined. From the hydrographic data of stream flow, it can be ascertained whether or not there is sufficient water to fill the reservoir, etc. The plans and specifications of all dams and storage works should be approved by Government engineers, and the actual construction and future maintenance of the dam inspected. Every storage project should be considered by the Government with reference to the future possibilities and requirements of the water supply affected and the lands to be irrigated.

During the freshet of 1912, several small storage dams in the 'Dry Belt' failed, and the escaped water caused serious damage in its rush down the valleys. Moreover, much valuable water was lost. All dams should be inspected by Government engineers to ensure safety.

All irrigating farmers should have some knowledge of the different kind of dams that are suitable for small storage works for irrigation purposes. The more they learn of this subject the less likely they will be to attempt the construction themselves in their own primitive way, and they will see that it pays in the long run to secure good engineering advice. There are a number of excellent books and pamphlets on the subject of dams, to which reference should be made.

Bulletin No. 249, (Parts I and II) of the United States Department of Agriculture (Office Experiment Stations) on 'The Storage of Water for Irrigation Purposes—Earth-fill Dams, Hydraulic-fill Dams, Timber Dams and Rock-fill Dams' may be specially recommended.

Barnes Estates, Limited, Walhachin, B.C. Irrigation Flume, showing Escape-gate and Distributing Lateral.

EVAPORATION FROM WATER SURFACES.

The amount and rate of evaporation from water surfaces is an important factor in storage problems, particularly in an arid or semi-arid district. The rate of evaporation depends chiefly on the temperature of the water, the temperature and humidity of the surrounding air, and the wind velocity.

While there have been deduced certain empirical formulæ for determining the evaporation, it is much more satisfactory to measure it directly by means of evaporation pans. The simplest form of evaporation pan is probably the best. It consists of a shallow pan of known dimensions. It is placed floating on the pond, lake or other water surface, and generally supported by a skeleton raft which prevents splashing by wave or wind action. The amount of water evaporated daily from the partially-filled pan is measured by means of a small vessel whose cubical contents are some convenient fraction of those of the pan. The amount of water evaporated is equivalent to the amount that must be added to bring the surface of the water in the pan back to normal. The amount of evaporation is expressed in inches of depth. Due allowance must be made for the daily rainfall. In addition to the evaporation pan, the following instruments are necessary to complete observations at each station: Rain gauge, thermometers, barometer, and wind gauge.

No studies of evaporation have been made in British Columbia, and it is recommended that a number of stations be started, particularly in the 'Dry Belt,' some in the low valleys and others at the higher elevations in the hills, where most of the storage and reservoirs are situated.

British Columbia Horticultural Estates, Thompson River at Walhachin. Suspended Wood-stave pipe. Span: 750 feet. Capacity: 5 sec. feet.

In general, evaporation from water surfaces is more rapid where the mean annual temperature is greater, and in places of lesser rainfall. The evaporation from water surfaces in the humid coast district is probably about 20 to 30 inches per annum, which is more than compensated for by the precipitation. In the arid districts of the 'Dry Belt,' the evaporation from an open reservoir, with few trees along the banks is probably from 80 to 100 inches. The average evaporation is fully 70 inches, most of it taking place from May to September.

SEEPAGE AND LOSSES IN TRANSMISSION.

In ordinary irrigation, as practiced in the 'Dry Belt' of British Columbia, not more than 50 per cent of the water that is diverted from the natural bed of a stream actually goes to irrigate the land for which it was taken. On account of the extreme

Western Canadian Ranching Company's Irrigation Farm, near Kamloops, B. C.

Western Canadian Ranching Company Manager's Residence, near Kamloops, B. C.

dryness of the district, water is a very valuable commodity, and it is evident that the loss of half of it is a serious condition of affairs. No wonder there is a cry of water scarcity, and no wonder it is claimed that there is insufficient water for lands at present undeveloped. This enormous loss in transmission is due mostly to seepage in unlined earthen ditches. In an arid country like the British Columbia 'Dry Belt' the subsoil is generally sand or gravel which is very porous and allows the water to readily seep through it. The amount of seepage is also dependent on the shape of the ditch, its slope, its age, the amount of silt in the water, etc.

Irrigation in the 'Dry Belt' is mostly carried on by individual farmers with small individual ditches, carrying anywhere from one to twenty second-feet, and it is in these small ditches that the proportionate loss by seepage is the greatest. Especially as the ditches are very crudely constructed, with no recognized or proper slope or shape.

To prevent this enormous loss of water by seepage it will be necessary for the Government to insist on all irrigation works being constructed and maintained according to the most modern methods. Irrigators should be instructed and advised regarding the construction of their ditches so that they may know the size of ditch, capacity and slope for the acreage to be irrigated and the nature of the ground through which the ditch must pass. The critical velocity for different kinds of soils and subsoils is also very important.

Even where earth ditches are well constructed, the seepage losses are great, and it will be necessary to resort to various plans to save the water, such as puddling by silt or cement, or lining with concrete, wood or steel.

During the measurements of the many irrigation streams in the 'Dry Belt,' the farmers continually called attention to the 'sinking' of the water in the natural bed of the streams. The water of many small creeks simply disappears to come out again a hundred yards or even a mile or so below. Numerous measurements were made at different points on a creek, and the point of sinking and reappearance located, together with the amount of loss.

In some cases the sinking is certainly an inconvenience to a farmer, but he seems to worry much more over this natural sinking than he does of the seepage losses in his own ditch. It will be necessary in some instances for the farmers to construct their intakes above the point of sinking; in others the water users or the Government will have to construct ditches or flumes to convey the whole flow over and past the danger points.

See Bulletin No. 44, British Columbia Department of Agriculture, page 32, for 'Conveyance losses of water in canals.'

IRRIGATION BY PUMPING.

The water supply for irrigation in the 'Dry Belt' of British Columbia is obtained almost entirely by gravity from small streams and lakes rising in the hills above the farm lands. The first lands to be taken up and cultivated were naturally those in the main valleys near the mouths of the best tributary creeks, and the earliest and dominant records for water are appurtenant to these lands, often commanding the whole flow of the particular stream. Later on, the higher bench lands were taken up, but the supply of water was dependent on the needs of the first-mentioned valley lands, and the development of the bench lands has been necessarily very slow.

The future development of these large areas of high bench lands depends to a great extent on the release of the water from the lower valley lands, the latter obtaining their supply by pumping from the unlimited sources of supply of the main rivers, such as Thompson and Fraser.

Moreover, there are also thousands of acres of excellent irrigable lands in the large valleys, lying adjacent to the large rivers, which have no gravity supply from adjacent tributary streams, and are idle and non-productive.

Irrigation by pumping has been extensively and successfully practised in some of the arid states of the United States, but as yet has only been experimented with in British Columbia, probably because the energies of the farmers have been directed mostly to obtaining a gravity supply, and perhaps on account of the high cost of fuel (gasolene, crude oil, coal and hydro-electric power) in British Columbia.

In spite of the great cost of installation and operation, there is no doubt that several thousands of acres of lands in the Thompson valley could be economically irrigated by pumping, in the majority of cases the lift being only from 25 to 75 feet.

Western Canada Ranching Company's Fruit Lands.

Cheap hydro-electric power from Adams river would be a tremendous boon to the agricultural development of the Thompson valley, and this excellent power should not be granted to any company without due consideration of this feature.

The subject of irrigation by pumping has been dealt with in numerous publications, the principal ones being: Farmers' Bulletin No. 394, Bulletin No. 201, and Bulletin No. 236, of the United States Department of Agriculture.

In Bulletin No. 44 of the British Columbia Department of Agriculture, irrigation by pumping has been discussed with special reference to British Columbia. All costs have been estimated for British Columbia. Special attention is called to this article.

WATER-POWERS.

As might be expected in a mountainous country like British Columbia, there are excellent water-power possibilities in the Railway Belt. This is particularly so in the humid coast district, where the precipitation in some places is as great as 150 to 200 inches per annum, and the run-off is over 100 inches in depth on the drainage area. There are no severe winter conditions, except in the highest elevations of the water-sheds. Most of the streams rise in the mountains at an elevation of from 5,000 to 7,000 feet, and discharge into Fraser river near mean sea-level. There are generally numerous falls and rapids where power can be practically and economically developed and a head of anywhere from 100 to 600 feet obtained. Fortunately, too, many of the rivers

Irrigable Lands, South Thompson Valley, near Kamloops, B. C.

broaden into large lakes in their course, which would serve as excellent storage reservoirs, for example, Coquitlam lake, Lillooet lake, Stave lake, Chehalis lake, etc. In the coast district the minimum period of flow occurs in March, although there is also a low stage in August or September. There are two freshet periods also, the larger in the spring about May or June, and the other a flashy flood in the late fall, about November.

In the 'Dry Belt' there are really no large water power developments possible. The precipitation is small, ranging only from 10 to 20 inches, and the percentage of run-off is much smaller than at the coast, in most cases being only from 20 to 30 per cent of the precipitation. The streams all have two low periods, one in July and August and the other for fully three months during the severe winter. The spring freshet is very large, generally taking place about the middle of May. Storage possibilities are only fair, being mostly small lakes near the headwaters of the streams, where the catchment basin is small. The exigencies of irrigation in the 'Dry Belt,' demanding the use of the water in the summer, do not concur with the requirements of water power.

In the Shuswap Lake district there are a number of good power developments possible, Adams river, for example, to which reference has been made elsewhere in this report. The run-off in this district is about 60 per cent of the precipitation, which ranges from 40 to 80 inches per annum. The minimum period occurs in March, although the run-off during the four winter months is small. Winter conditions exist for about three months, although some years the winter is very mild.

In the Columbia district there are water-power possibilities on nearly every stream that rises in the mountains and empties into the large arteries. In only very few cases, however, are there good storage reservoirs. Winter conditions are exceptionally severe. During the four winter months there is a very low stage in the run-off. The maximum period is during July and August when the snow on the mountains is melted.

(A) DEVELOPED WATER-POWERS.

Following is a list of the developed water-powers in the Railway Belt. Except the first two these are mostly very small developments, ranging from 50 to 300 horse-power. Reference has been made to these power developments under the headings of their respective streams.

Coquitlam-Buntzen plant, from Coquitlam lake and Buntzen lake.

Stave falls.

Small industrial and lighting plant by the C.P.R. at North Bend.

Small industrial plant on Murray creek, near Spence's Bridge.

Small power plant on Bonaparte river, near Ashcroft, used in the town of Ashcroft for lighting, etc.

Municipal plant on Barrier river by the city of Kamloops. This plant is now under construction. It is located outside the Railway Belt, about 45 miles from Kamloops. (2,000 to 5,000 horse-power).

Small lighting plant on Fortunes creek by the town of Armstrong.

Small lighting plant on Crazy creek at Taft, B.C.

City of Revelstoke power plant on Illecillewaet river, near Revelstoke. (750 horse-power.)

Small industrial plant on Mill creek, near Arrowhead. Only used when the mill is in operation.

Small lighting plant for Glacier House at Glacier.

Small mining plant on Cathedral creek, near Field, by the Mount Stephen Mining Syndicate.

For a detailed description of these plants see the forthcoming report of the Commission of Conservation on "The Water-powers of Western Canada."

(B) UNDEVELOPED WATER-POWERS.

In estimating the amount of available horse-power on any stream or in a district we must consider as well:—

(1) The present economic value of the water-power, including the present market, the practicability and cost of development and the relative cost of fuel power.

(2) The future economic value, with regard to the growth and development of the surrounding country, the probably increased efficiency of power plants and the future price of fuel power.

While at the present time the first consideration is seemingly of prime importance, yet a wise Government should look to the future, and inventory the maximum uses to which such a great natural resource as water-power can be placed. No power development, for instance, should be allowed at the present time which will prevent the same or an adjacent site from being some day developed to its maximum capacity, looking to the time when the people of the country, who are the real owners of all the natural resources, shall be driven by the exigencies of fortune to the use of all the water-power that can be reasonably produced. The time is coming soon when the "white coal" of British Columbia will be utilized to the last degree.

The present and future water-power possibilities of some sixty streams, large and small, were investigated by the engineers of the Railway Belt Hydrographic Survey, a reconnaissance of the available head, the storage possibilities, the power and dam sites, the maximum, minimum and mean flow, being made. This information was furnished to the Commission of Conservation, and will appear in the forthcoming report of that Commission on "The Water-powers of Western Canada," and it would only be superfluous to publish it here.

RECLAMATION AND DRAINAGE.

Owing to the mountainous nature of the Railway Belt, with the main rivers running in well-pronounced beds, and the valley lands sloping toward the rivers, there are not many districts where large tracts of overflow or swamp lands exist. In the lower Fraser valley, however, there is considerable land that is subject to periodical overflow during the flood period of the Fraser and its tributaries in June and July. The Pitt river meadows lie adjacent to Pitt river, which is a tidal stream affected by the Fraser river flood waters. Most of these lands have already been reclaimed by dyking, and other parts are being reclaimed at the present time by the construction of elaborate dykes and ditches.

On the south side of Fraser river is the Chilliwack Sumas district, where from 30,000 to 50,000 acres of valuable agricultural lands are subject to periodical or occasional overflow from the Fraser and Chilliwack rivers. Parts of these lands have been successfully reclaimed, and an extensive project, the Sumas dyking scheme, is now in contemplation whereby the remainder of the district, comprising nearly 30,000 acres, will be dyked and rendered free from flooding. This project will necessitate the diversion and control of Chilliwack river, which now enters Sumas lake via the Vedder channel; the construction of extensive dykes to prevent the ingress of the Fraser floods; and the pumping and draining of Sumas lake, a shallow lake of about 9,000 acres.

Projects of this kind are carried on under the regulations of the provisional drainage, dyking and irrigation act.

In the upper Columbia valley from Golden to Windermere (a distance of 80 miles) the river runs through a valley from half to one and one-half miles wide. In June, July and August, the river is in flood and the bottom lands were covered to a depth of from one to three feet. See discussion on "Columbia river above Golden." By straightening, dredging and dyking the Columbia river and controlling the flood flow of such tributaries as Toby creek, Horsethief creek, No. 2 creek, Bugaboo creek and Spillimacheen river, as well as a few small streams, fully 40,000 to 50,000 acres of now useless lands could be reclaimed and turned into good agricultural or hay lands.

The records of run-off in the upper Columbia valley obtained by the Hydrographic Survey will be of great value to this project when the time comes for its undertaking.

The subject of drainage of irrigated land is not discussed here, and reference should be made to the various pamphlets issued by the United States Department of

Agriculture. The principal bulletins on this subject are: Farmers' Bulletin No. 371, Bulletin No. 217 and Bulletin No. 240.

The greater part of the irrigated beach lands in the Dry Belt are sloping lands with gravelly subsoil, which do not require surface or under drainage. But the more level bottom lands need careful watching. It is now accepted by all scientific irrigationists that too much water is generally applied to irrigated land, with no drainage, the land often becomes strongly alkaline, or sour, and is rendered almost unfit for agriculture.

PART II

HYDROGRAPHIC DATA OF STREAM FLOW.

DEFINITIONS OF TERMS.

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

The units used in this report are second-feet, second-feet per square mile, run-off in inches and acre-feet. They may be defined as follows:—

"Second-feet" is an abbreviation for cubic feet per second (c.f.s.) and is the rate of discharge of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of factors given in the following table of equivalents.

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

"Run-off in inches" 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 usually expressed in depth in inches

"Acre-foot" is equivalent to 43,560 cubic feet, which quantity is the number of square feet in one acre. It is the quantity of water required to cover an acre to the depth of 1 foot, and is the common unit of measurement of quantity. It is generally used in connection with storage.

"Miner's inch" is a unit of measurement representing a rate of flow, and although it is in common use in British Columbia, it is, unfortunately, not a good unit. It differs in various parts of America, and in British Columbia is defined as follows:

> "A miner's inch is the quantity of water that will pass through an orifice two inches high and one-half-inch wide made in a two-inch plank, the water to have a constant head of seven inches above the upper side of the orifice, and every additional inch of water shall mean so much as will pass through the said orifice extended horizontally half an inch."

A second-foot is equal to 35·71 British Columbia miner's inches.

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

CONVENIENT EQUIVALENTS.

1 second-foot equals 35·71 British Columbia miner's inches, or one British Columbia miner's inch equals 1·68 cubic feet per minute.

1 second-foot equals 6·23 British Imperial gallons per second; equals 538,272 gallons for one day.

1 second-foot equals 7·48 United States gallons per second; equals 646,272 gallons for one day.

1 second-foot for one year covers 1 square mile 1·131 feet or 13·572 inches deep.

1 second-foot for one year equals 31,536,000 cubic feet; equals 724 acre-feet.

1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one 28-day month covers 1 square mile 1·041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1·079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1·116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1·153 inches deep.
1 second-foot for one day equals 1·983 acre-feet.
1 second-foot for one 28-day month equals 55·54 acre-feet.
1 second-foot for one 29-day month equals 57·52 acre-feet.
1 second-foot for one 30-day month equals 59·50 acre-feet.
1 second-foot for one 31-day month equals 61·49 acre-feet.
100 British Imperial gallons per minute equals 0·268 second-foot.
100 United States gallons per minute equals 0·223 second-foot.
1,000,000 British Imperial gallons per day equals 1·86 second-feet.
1,000,000 United States gallons per day equals 1·55 second-feet.
1,000,000 British Imperial gallons equals 3·68 acre-feet.
1,000,000 United States gallons equals 3·07 acre-feet.
1,000,000 cubic feet equals 22·95 acre-feet.
1 acre-foot equals 43,560 cubic feet.
1 acre-foot equals 271,472 British Imperial gallons.
1 acre-foot equals 325,850 United States gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0·0737 second-foot per year.
1 acre equals 43,560 square feet.
1 cubic foot equals 6·23 British Imperial gallons.
1 cubic foot equals 7·48 United States gallons.
1 cubic foot of water weighs 62·5 pounds.
1 foot per second equals 0·682 miles per hour.
1 horse-power equals 550 foot pounds per second.
1 horse-power equals 746 watts.
1 horse-power equals 1 second-foot falling 8·80 feet.

To calculate water-power quickly: *Sec.-ft.* × *fall in feet* ÷ 11 = net horse-power on water wheel, realizing 80 per cent of theoretical power.

ACCURACY AND RELIABILITY OF DATA.

The accuracy of stream-flow data depends primarily on the natural conditions at the gauging station, and on the methods and care with which the data are collected. Errors of the first group depend on the degree of permanency of channel and of permanency of the relation between discharge and stage.

Errors of the second class are due: First, to errors in observation of stage; second, to errors in measurements of flow; and, third, to errors due to misinterpretation of stage and flow data.

Practically all discharge measurements made under fair conditions are within 5 per cent of the discharge at the time of observation. Inasmuch as the errors of meter measurements are largely compensating, the mean rating curve, when well-defined, is much more accurate than the individual measurements.

In order to give information regarding the probable accuracy of the computed results, an accuracy column is added, as follows: Accuracy "A" indicated that the mean accuracy is within 5 per cent; "B", within 10 per cent; "C" within 15 per cent; and "D," within 25 per cent. Special conditions are covered by foot notes.

CO-OPERATION AND ACKNOWLEDGMENTS.

When the Railway Belt Hydrographic Survey was being organized, valuable advice and assistance was received from members of the United States Geological Survey, particularly Mr. M. O. Leighton, chief hydrographer; Mr. R. H. Bolster, his assistant; Mr. Robert Follansbee and Mr. W. G. Hoyt, district engineers. It was due to the courtesy of Mr. Leighton that the service of one of the United States field hydrographers, Mr. C. R. Adams was obtained for a period of three months. Under Mr. Adams' guidance and experience the work was organized in British Columbia, and many gauging stations established.

The experience of the United States Geological Survey, in its many years study of water supply and water resources, has been profitably used by us, not only in our methods of field work and office computations, but we have freely used the same conclusions and opinion found in their valuable water supply papers and other publications

Thanks also are due Mr. G. R. G. Conway, of the Vancouver Power Company, and Mr. R. F. Hayward, of the Western Canada Power Company, Vancouver, for their sympathy and co-operation in our hydrographic studies of power streams near the coast.

Certain stream flow records of Jamieson creek were obtained from Mr. A. Meighen, C. E., engineer of the British Columbia Fruitlands Co., Kamloops; and the records of gauge heights on Columbia river at Golden were secured through the Columbia River Lumber Company.

For a complete discussion on the methods of hydrographic surveys, the measurements of stream flow, instruments and equipment, field methods, office methods, discussion and use of data, etc., reference should be made to that admirable text-book and manual, "River Discharge," by Hoyt and Grover (John Wiley and Sons) 2nd edition.

The Hydrographic Survey wishes to give due credit to all from whom co-operation or data have been received. At the same time, the Survey does not assume any responsibility for inaccuracies found in such data, although it is believed that most of them are reasonably accurate.

ARRANGEMENT AND ORDERS OF DATA.

It is the usual custom to arrange hydrographic data of stream flow according to drainage areas. This method was at first attempted, but it was found not to work satisfactorily in a peculiar district such as the Railway Belt. The Belt is a long narrow strip of territory of which north and south boundaries are defined by the location of the main line of the Canadian Pacific railway through British Columbia. A large portion of the upper Columbia, Thompson and Fraser drainages are, it is true, to be found in the Railway Belt, but on the whole, the watersheds of nearly all important streams are only partly in the Belt. When an attempt was made to arrange the streams according to primary, secondary and tertiary drainage areas, chaos seemed to be the result. It has been deemed advisable, therefore, to place all streams in alphabetical order, and it is hoped that, with the help of the accompanying map, and the suggestive system of station numbers, reference to any particular stream, drainage or district will be made comparatively easy.

NUMBERING OF GAUGING STATIONS.

Each hydrographic or river station is given a separate number, by which it is known. As has been said, the Railway Belt has been divided for convenience into four districts, Nos. 1, 2, 3 and 4. Each station is given a number, the first integer of which signifies the number of the district in which it is situated. For example, Station No. 119 is the river station on Coquihalla river, being the 19th station in District No. 1. Station 215, is Bonaparte river, which is the 15th station in district No. 2, or the Dry Belt; and so on.

On account of the peculiar nature of the Railway Belt, which is a long narrow strip of territory, it has been almost impossible to arrange the stations, or to number them, in the usual manner according to drainage areas. It is believed that an alphabetical arrangement of stations, with the suggestive system of numbers, and the map showing their location, will best meet the peculiarities of the Railway Belt.

LIST OF REGULAR GAUGING STATIONS.

NOTE.—Stations marked with an asterisk (*) have been only recently established and sufficient measurements of discharge have not been taken to deduce a curve and daily discharges. Gauge readings are being systematically recorded. Each station is followed by its respective station number.

Adams River(301).
*Akolkolex river (408).
Anderson River (130), abandoned 1912.
Barnes Creek (245).
*Belknap Creek (106).
Blueberry River (409).
Boleon Creek (306).
Bonaparte River (215).
Botanie Creek (205)
*Boulder Creek (126).
*Brandt Creek (107).
Bugaboo Creek (419).
Cache Creek (220).
Cahilty Creek (244).
Campbell Creek, at Todds Corners (250).
Campbell Creek, above Campbell Estate diversion (251).
Canoe Creek (310).
*Canyon Creek (423).
Chartrand Creek (259)
Chase Creek (260).
Chehalis River (117).
Cherry Creek (225).
Chilliwack River (110).
Columbia River, at Revelstoke (401).
Columbia River at Golden (402).
Columbia River, at Spillimacheen (403).
Columbia River, at Athalmer (404).
Coquihalla River (119).
*Coquitlam River (upper), (123)
Cornwall Creek (209)
Criss Creek (224).
Darcy Creek (229)
Deadman River, above Walhachin Flume intake (221).
Deadman River, in Walhachin flume (222)
Deadman River, below Walhachin flume intake, abandoned 1912 (223)
*Duffy Creek (228)
Eagle River (312)
Edward's Creek, upper station (240) abandoned 1912
Edwards Creek, at Devick's upper ranch (241)
Essell Creek (307)
Fortunes Creek (309).
Fraser River, at Lytton (402)
Fraser River, at Hope (101)
Gilley Creek (112).
*Gold Creek (122).
Greenstone Creek (261).
Guichon Creek, above Mamit lake (214).
Guichon Creek at mouth (213)
Hat Creek, at Colley's ranch (216)
Hat Creek, in Hammond's ditch (217).
Hat Creek, at Hat Creek ranch (218).
Hat Creek, at Hat Creek ranch (lower station), (269) abandoned 1911
Hefferly Creek, at mouth (236).
Hefferly Creek, upper station (237)
Hefferly Creek, in Anderson's ditch (238)
Hefferly Creek, in Crawshaw's ditch (239)
*Hixon Creek (105).
Horsethief Creek (421).
Illecillewaet River (406).
*Incomappleux River (407).
Ingram Creek (308).
Jacko Creek (231).
Jameson Creek, above B.C.F. diversion (232).
Jamieson Creek, below B.C.F. diversion (233).
Jones Lake (125).
Jordan River (405).
Kicking Horse River, at Golden (410).
Kicking Horse River, at Field (411).
Kicking Horse River, at No 2 tunnel (412).
Lillooet River, South (132).
Lillooet River, North (133).
Louis Creek (243).
Martin Creek(256), abandoned 1911.
Meadow Creek (257).
Mesliloet River, at mouth (103)
*Mesliloet River, upper station (101)
Monte Creek, Summit Lake diversion (254)
Monte Creek, below Summit Lake diversion (253)
Monte Creek above Bostock diversion (252)
Moulton Creek (247).
Murray Creek (263)
Nahatlatch River, below Nahatlatch lakes (127).
*Nahatlatch River, lower station (128)
Neds Creek (255).
Nelson Creek (216).
Nicola River, near mouth (210)
Nicola River, at Merritt (211).
Niskonlith Creek (219).
*Norton Creek (108)
No. 2 Creek (120)
Oregon Jack Creek (208)
Ottertail River (413).
Paul Creek, above Pinantan lake (234), abandoned 1912
*Paul Creek, below Pinantan lake (268)
Paul Creek, below Paul lake (235)
Pemberton Creek (248)
Pendleton Creek (227)
Pollard Creek (116)
Rainbow Creek (114)
Robbins Creek (261)
*Rushton Creek (115)
Salmon River, at Woods' ranch (302).
Salmon River, at Shuswap (303)
Salmon River, at Salmon Arm (304)
Scottie Creek (219)
Shuswap River (311)
Silver Hope Creek (left branch), (120).
Silver Hope Creek (right branch), (121)
*Silver Pitt Creek (113)
Spillimacheen River (418).
Spius Creek (212)
Stave River (129)
Stein Creek (131)
Sullivan Creek (242)

Sweltzer Creek (111).
Thompson River, South Thompson at Chase (201).
•Thompson River, North Thompson at Cooney's ranch (203).
Thompson River, at Kamloops (202).
Thompson River, at Spence's Bridge (204).
Toby Creek (422).
Tranquille River (230).
Twaal Creek (206), abandoned 1911.
Venables Creek (207).
•Viola Creek (124).
Warren Creek (305).
Witch Creek (258).
Yoho River (415).
•Young Creek (109).

LIST OF MISCELLANEOUS GAUGING STATIONS.

NOTE.—Each station is followed by its respective station number.

Alkali Creek (226).
Bear Creek (313).
Beard Creek (423).
Blue Earth Creek (262).
Cartwright Creek (424).
Coltey Creek (271).
Emerald River (414).
Gordon Creek (266).
Hogranch Creek (425).
Horse Creek (416).
Kicking Horse River, at Palliser (426).
King Creek (272).
Lane Creek 267).
Lloyd Creek (273).
Malden Creek (265).
Nelson Creek (127).
Nikala Creek (134).
Palmer's Creek (311).
Peterson Creek (274)
Quenville Creek (270).
Statlu Creek (118).
Three-Mile Creek.
Twenty-eight Mile Creek (128)
Washout Creek (417).

HYDROGRAPHIC DATA OF STREAM FLOW.

ADAMS RIVER (301).

Adams river has its source in Adams lake at an elevation of 1,349 feet and, flowing in a southerly direction, discharges into Shuswap lake near the town of Chase at an elevation of 1,153 feet. The following tributaries enter from the west: Bear creek, Bush creek, Pass creek, and Upper Adams river; Nikwikwaia creek enters from the east. Adams river is a part of the Shuswap lake-Thompson drainage. The drainage area, as measured from a provincial map, scale 20 miles to 1 inch, is 1,700 square miles; of this area Adams lake constitutes 60 square miles. The water is used extensively for logging by the Adams River Lumber Company.

The Upper Adams river rises in Tum-tum lake, about 80 miles north of the main line of the C.P.R., near Chase. From this lake it flows in a southerly direction for about 40 miles into Adams lake, a magnificent sheet of water, 40 miles long, a mile and a half wide, surrounded by high mountains. The lake rises 4 to 5 feet above its low-water level, high water taking place in June. There is some agricultural land around the lake, but it is sparsely settled, and if it were desirable to use the lake as a storage reservoir for water-power purposes, and retain the lake at its high-water level, no important interests would be affected. At its southerly end Adams lake empties into Adams river, where it falls 190 feet into Shuswap lake in the short distance of 6 miles.

There are large areas of valuable timber along Adams lake, and its several tributaries. The Adams River Lumber Company is the largest operating company; this company has constructed a dam on Adams river, about one-quarter of a mile from the outlet of the lake, for log-driving purposes. The dam is rock-filled, timber-cribbed, about 180 feet long and 15 feet high; it has six sluice-gates, and a fish ladder. On account of the excellent storage of Adams lake, it will be easy to conserve the greater part, if not all, of the run-off from season to season. The total discharge of 1912 will give a good daily mean for that period; the year 1912, however, is above the normal in run-off in this locality, and so should not be taken as representative of an average year

The Adams River station was established June 31, 1911, by C. E. Richardson The measuring section is located 250 yards above the Adams River Lumber Company's dam, and 25 yards above the old wing dam. The gauge is a vertical staff gauge (fir), 2 inches by 4 inches by 8 feet marked in feet and tenths with black paint, fastened to a rock-filled crib 7 feet high, situated in a back-eddy on the right bank, 75 yards below the dam, and built to protect the gauge from logs and ice. The measurements are made by means of the following equipment. A ¾-inch mild steel cable is stretched across the river; 20 feet downstream a tag line of ¼-inch mild steel cable is stretched across and pulled taut, a boat is fastened by rope to the larger cable, and allowed to rest directly below the tag line; measurements are made every 20 feet.

This is an excellent measuring section; there is only one channel, with a permanent bed; the banks are good, and the current is even. The datum of the gauge is referred to three bench-marks.

Adams river is one of the best undeveloped powers in the interior of British Columbia. Fully 30,000 to 40,000 horse-power could be developed by utilizing the full head of 190 feet. This would be an expensive installation, however, and it might be economically advisable to use only the upper site of about 68 feet.

The power could be transmitted to Kamloops, Chase, Salmon Arm, Sicamous, Armstrong, Enderbey and Vernon, and would be of tremendous importance for pumping water from Thompson river to irrigate thousands of acres of now useless lands along the Thompson valley.

DISCHARGE MEASUREMENTS OF ADAMS RIVER, BELOW ADAMS LAKE, IN 1911.

Date.	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
[illegible] 7	C. E. Richardson	1018	450	2,780	2·1	4·4	5,900
[illegible] 8	C. E. R. and W. M. P.	1055	330	1,770	0·3	0·57	484*
[illegible]	"	1055	350	1,700	0·4	0·9	602*
[illegible]	"	1055	350	1,720	1·2	2·6	1,960*
[illegible]	"	1055	430	1,700	1·9	3·4	3,160*
[illegible]	"	1055	410	1,670	0·7	1·7	1,180*
[illegible]	[illegible] Richardson ..	1055	100	95	1·4	−0·3	130†

* Measurement made from boat above dam. † Measurement made by wading below dam.

Adams River Lumber Company's Dam.

Adams River Lumber Company's Dam.

DAILY GAUGE HEIGHT AND DISCHARGE OF ADAMS RIVER BELOW ADAMS LAKE, FOR 1911.

Day.	July.		August.		November.		December.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	5,610	3·2	2,870	....	....	−0·3	135
2	4·3	5,610	3·2	2,870	....	....	−0·3	135
3	4·4	5,900	3·2	2,870	....	....	−0·3	135
4	4·5	6,200	3·2	2,870	....	....	−0·3	135
5	4·4	5,900	3·2	2,870	....	....	−0·3	135
6	4·4	5,900	3·2	2,870	....	....	−0·3	135
7	4·4	5,900	3·2	2,870	....	....	−0·3	135
8	4·4	5,900	3·2	2,870	....	....	−0·3	135
9	4·5	6,200	3·2	2,870	....	....	−0·3	135
10	4·6	6,500	....	....	....	....	−0·3	135
11	4·3	5,610	....	....	1·7	1,060	−0·3	135
12	4·3	5,610	....	....	1·7	1,060	−0·33	130
13	4·1	5,030	....	....	1·7	1,060	−0·3	135
14	3·9	4,480	....	....	1·7	1,060	−0·3	135
15	3·9	4,480	....	....	2·8	2,205	−0·3	135
16	4·6	6,500	....	....	3·0	2,510	−0·32	133
17	4·6	6,500	....	....	2·8	2,205	−0·32	133
18	4·6	6,500	....	....	2·8	2,205	−0·32	133
19	4·2	5,320	....	....	2·7	2,067	−0·32	133
20	4·1	5,030	....	....	2·6	1,935	−0·32	133
21	3·8	4,220	....	....	2·6	1,935	−0·32	133
22	3·6	3,730	....	....	2·5	1,810	−0·32	133
23	3·6	3,730	....	....	−0·3	135	−0·32	133
24	3·4	3,280	....	....	−0·3	135	−0·32	133
25	3·6	3,730	....	....	−0·3	135	−0·32	133
26	3·5	3,500	....	....	−0·3	135	−0·32	133
27	3·6	3,730	....	....	−0·3	135	−0·32	133
28	3·5	3,500	....	....	−0·3	135	−0·32	133
29	3·5	3,500	....	....	−0·3	135	−0·3	135
30	3·3	3,070	....	....	−0·3	135	−0·3	135
31	3·7	3,970	....	....	−0·3	135	−0·3	135

MONTHLY DISCHARGE OF ADAMS RIVER BELOW ADAMS LAKE, FOR 1911

(Drainage area, 1,700 square miles.)

Month.	Discharge in Second-Feet				Run-off.		Rain-fall.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
July	6,500	3,070	4,988	2.93	3.38	306,800	
December	135	130	134	·08	·09	8,239	
The period.						..	30

NOTE.—Gauge was washed out early in August, and was not replaced until November.
Open flow conditions exist throughout the winter months at this station.
Discharge is artificially controlled by Adams River Lumber Co's dam. The maximum discharge was obtained with all six gates open and the lake at about its highest level. It is not necessarily the true maximum discharge of the river.
The minimum discharge was obtained with all six gates of the dam closed and the fishway only open. It is not necessarily the true minimum.
Accuracy "A."

DAILY GAUGE HEIGHT AND DISCHARGE OF ADAMS RIVER BELOW ADAMS LAKE FOR 1912.

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	−0·3	135	−0·33	127	2·1	1,380	−0·4	110	−0·5	85	5·0	7,800
2	−0·3	135	−0·33	127	2·1	1,380	−0·4	110	−0·5	85	3·6	3,730
3	−0·3	135	−0·33	127	2·1	1,380	−0·4	110	−0·5	85	3·6	3,730
4	−0·3	135	−0·33	127	1·9	1,210	−0·4	110	−0·5	85	3·6	3,730
5	−0·3	135	−0·33	127	1·7	1,060	−0·4	110	−0·5	85	−0·1	195
6	−0·3	135	−0·33	127	1·7	1,060	−0·4	110	−0·5	85	−0·1	195
7	−0·3	135	−0·33	127	1·6	995	−0·4	110	−0·5	85	3·6	3,730
8	−0·3	135	−0·33	127	1·6	995	−0·4	110	−0·5	85	3·5	3,500
9	−0·3	135	−0·33	127	1·6	995	−0·4	110	−0·4	110	3·5	3,500
10	−0·3	135	−0·33	127	1·5	930	−0·4	110	−0·4	110	3·6	3,730
11	−0·3	135	−0·33	127	1·5	930	−0·4	110	4·0	4,750	4·1	5,030
12	−0·3	135	−0·33	127	1·4	870	−0·4	110	4·0	4,750	4·1	5,030
13	−0·3	135	−0·33	127	1·4	870	−0·4	110	4·2	5,330	4·1	5,030
14	−0·3	135	−0·33	127	1·3	810	−0·4	110	4·3	5,610	4·3	5,610
15	−0·3	135	−0·33	127	1·3	810	−0·4	110	4·5	6,200	4·2	5,320
16	−0·3	135	−0·33	127	1·3	810	−0·4	110	4·6	6,500	4·2	5,320
17	3·2	2,870	−0·33	127	1·3	810	−0·4	110	4·6	6,500	4·2	5,320
18	3·2	2,870	−0·33	127	1·2	755	−0·4	110	4·6	6,500	4·2	5,320
19	2·9	2,350	−0·33	127	1·2	755	2·5	1,810	5·7	10,500	4·2	5,320
20	2·9	2,350	1·80	1,130	1·1	700	2·5	1,810	5·7	10,500	4·3	5,610
21	2·8	2,200	1·80	1,130	1·1	700	2·6	1,930	5·7	10,500	4·3	5,610
22	2·8	2,200	1·80	1,130	1·1	700	2·6	1,930	5·7	10,500	4·3	5,610
23	2·8	2,200	2·3	1,580	1·0	650	2·7	2,070	5·7	10,500	4·8	7,100
24	2·7	2,070	2·3	1,580	1·0	650	2·7	2,070	5·7	10,500	4·8	7,100
25	2·6	1,930	2·3	1,580	1·0	650	2·7	2,070	5·7	10,500	4·8	7,100
26	−0·3	135	2·3	1,580	1·0	650	2·7	2,070	5·6	10,100	4·8	7,100
27	−0·3	135	2·3	1,580	0·9	600	2·7	2,070	5·5	9,700	4·5	6,200
28	−0·3	135	2·3	1,580	0·9	600	2·7	2,070	5·4	9,300	4·5	6,200
29	−0·3	135	2·2	1,490	0·9	600	2·7	2,070	5·2	8,500	4·5	6,200
30	−0·3	135	......		0·9	600	−0·5	85	5·1	8,150	4·4	5,900
31	−0·33	127	......		0·4	110			5·1	8,150	4·7	......

DAILY GAUGE HEIGHT AND DISCHARGE OF ADAMS RIVER BELOW ADAMS LAKE FOR 1912.—*Continued.*

Day.	July.		August.		September.		October.		November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·40	5,900	4·7	6,800	4·5	6,200	2·5	1,810	−0·1	195	−0·2	165
2	4·30	5,610	4·6	6,500	4·4	5,900	2·4	1,690	−0·1	195	−0·2	165
3	3·60	3,730	4·7	6,800	4·4	5,900	2·3	1,585	−0·1	195	−0·2	165
4	1·90	1,210	0·2	300	3·4	3,280	2·2	1,485	−0·1	195	−0·2	165
5	1·90	1,210	0·1	265	2·5	1,810	2·2	1,485	−0·1	195	−0·2	165
6	4·60	6,500	0·1	265	3·9	4,480	2·2	1,485	−0·1	195	−0·2	165
7	3·60	3,730	5·5	9,700	3·8	4,220	2·2	1,485	−0·1	195	−0·2	165
8	3·40	3,280	5·5	9,700	3·8	4,220	2·1	1,385	−0·1	195	−0·2	165
9	3·80	4,220	4·7	6,800	3·8	4,220	2·1	1,385	−0·1	195	3·0	2,510
10	4·02	4,800	0·1	265	3·7	3,970	2·1	1,385	−0·1	195	3·0	2,510
11	4·8	7,100	5·7	10,500	3·7	3,970	2·1	1,385	−0·1	195	2·9	2,350
12	4·8	7,100	5·7	10,500	3·6	3,730	2·0	1,290	1·2	755	2·9	2,350
13	4·8	7,100	0·1	265	3·6	3,730	2·0	1,290	1·2	755	2·9	2,350
14	4·85	7,275	2·7	2,070	3·5	3,500	2·0	1,290	1·2	755	2·9	2,350
15	3·1	2,680	5·5	9,700	3·4	3,280	1·9	1,210	1·2	755	2·8	2,205
16	3·2	2,870	0·1	265	3·3	3,070	1·9	1,210	1·2	755	2·8	2,205
17	3·2	2,870	5·5	9,700	3·3	3,070	1·9	1,210	1·1	702	2·8	2,205
18	5·1	8,150	5·4	9,300	3·2	2,870	1·9	1,210	1·1	702	2·7	2,067
19	5·1	8,150	5·0	7,800	3·1	2,680	1·9	1,210	1·0	630	2·7	2,067
20	3·4	3,280	4·9	7,450	3·1	2,680	1·9	1,210	1·0	650	2·6	1,935
21	4·9	7,450	4·9	7,450	3·0	2,510	1·9	1,210	0·9	600	2·6	1,935
22	3·3	3,070	4·9	7,450	3·0	2,510	−0·1	195	−0·1	195	2·5	1,810
23	5·5	9,700	4·8	7,100	2·9	2,350	−0·1	195	−0·2	165	2·5	1,810
24	4·8	7,100	4·8	7,100	2·9	2,350	−0·1	195	−0·2	165	2·4	1,694
25	4·8	7,100	0·1	265	2·8	2,200	−0·1	195	−0·2	165	2·4	1,694
26	4·8	7,100	2·7	2,070	2·8	2,200	−0·1	195	−0·2	165	2·3	1,585
27	2·1	1,385	2·7	2,070	2·7	2,070	−0·1	195	−0·2	165	−0·2	165
28	4·9	7,450	4·9	7,450	2·6	1,935	−0·1	195	−0·2	165	−0·2	165
29	4·9	7,450	4·9	7,450	2·6	1,935	−0·1	195	−0·2	165	−0·2	165
30	4·9	7,450	4·8	7,100	2·5	1,810	−0·1	195	−0·2	165	−0·2	165
31	4·7	6,800	4·7	6,800	....	....	−0·1	195	....	....	−0·2	165

MONTHLY DISCHARGE OF ADAMS RIVER, BELOW ADAMS LAKE, FOR 1912.

(Drainage area, 1,700 square miles.)

Month.	Discharge in Second Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per square mile	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	2,870	127	774	·46	·53	47,600	
February	1,580	127	578	·34	·37	33,250	
March	1,380	110	839	·49	·56	51,600	
April	2,070	85	801	·47	·52	47,650	
May	10,500	85	5,627	3·31	3·82	346,200	
June	7,800	195	5,029	2·96	3·30	299,300	
July	9,700	1,210	5,446	3·20	3·69	335,100	
August	10,500	265	5,718	3·36	3·87	351,700	
September	6,200	1,810	3,288	1·93	2·15	195,800	
October	1,810	195	995	·58	·67	61,200	
November	755	165	358	0·21	0·23	21,300	
December	2,510	185	1,283	0·75	0·86	78,700	
The year	10,500	85	2,561	1·50	20·57	1,869,400	30

NOTE.—See notes on 1911 monthly discharge sheet.
The mean flow for 1912 was 2,561 c.f.s.
Accuracy, "A."

ALKALI CREEK (226).

Alkali creek is a small irrigation stream about five miles long in the centre of the 'Dry Belt'; it has its source in the hills south of Kamloops at an elevation of 4,000 feet and flows into Cherry creek in section 34, township 19 at an elevation of 2,500 feet. The drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 13 square miles, and belongs to the Cherry South Thompson drainage.

The mean annual precipitation is about 10 inches, the summers are hot and dry and the winters long and very cold (-30° F.); the stream only runs during the spring of the year, and was entirely dry during 1911.

There are two small lakes, about 10 acres in area, which have small storage dams 4 feet in height; on one of these lakes—an unnamed lake two miles from the source—a higher dam would be feasible, though it is doubtful whether the freshet in a normal year would be sufficient to fill the enlarged reservoir. The other lake—Hughes lake—is about half a mile from the mouth of Alkali creek.

In the spring of 1912, a small temporary gauge was established and several measurements were taken.

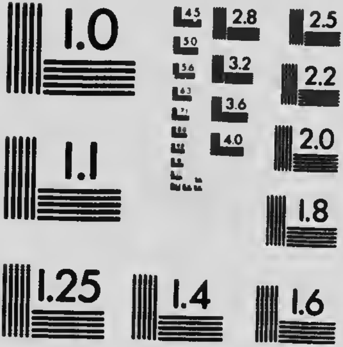
ANDERSON RIVER (130).

Anderson river rises in the Anderson hills at an elevation of 6,000 feet and discharges into the Fraser river in township 10, range 26 west 6th meridian at an altitude of 500 feet, having a drainage area of 200 square miles. The water is at present unused, though there are small power possibilities at the mouth of the stream.

The main branch of Anderson river rises close to the Fraser river, and flows north, for ten miles or more, within five miles of the Fraser. Uztlins river, the most important tributary of Anderson river, rises near the head-waters of Spins creek, and flows in a westerly direction to meet the Anderson. There is a deep canyon near the mouth of the Anderson river which extends up stream for many miles; at the canyon's

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



mouth there is a large bar of sand and gravel which, exposed at low water, is covered by the waters of the Fraser at its high stages. This is known as Boston bar, and there were more than a thousand men upon it in the days of gold panning on the Fraser river.

There is an Indian reserve on the south side of the Anderson river which contains the only land being cultivated in the watershed. The only means of communication in the valley is a pack trail which climbs from the Fraser valley to the top of the canyon crossing the Uztlius river and the divide to Spius creek, passing thence to the Nicola country. The country is very rough with several peaks rising to an altitude of 6,000 feet; the hillsides are steep and most of the watershed is well wooded.

The station is at the mouth of the canyon, 4 miles from the North Bend ferry, where the banks are high, rocky and wooded, and the river is confined to one channel. It was established by C. G. Cline, on April 9, 1912, gauge readings being taken continuously till September 30, 1912. Measurements are made by wading at low water, and from a canoe attached to a cable at high water.

The gauge itself is a chain gauge, being of No. 16 double link jack chain, 24.0 feet long with a 24 pound sash weight. There is a danger that at extremely high stages of the Fraser the backwater from it may affect the gauge readings.

Discharge Measurements of Anderson River, near Mouth, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
April 9	C. G. Cline	1046	80	141	2·3	2·8	322
July 16	"	1046	75	128	1·3	2·0	166
Sept. 27	"	1046	60	127	0·6	1·6	76

Daily Gauge Height and Discharge of Anderson River, near Mouth, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	...	326	3·1	396	3·5	495	2·8	326	1·6	80	1·9	136
2	...	326	3·1	396	3·2	420	2·7	303	1·6	80	1·9	136
3	...	326	3·2	420	3·0	373	2·5	259	1·6	80	1·9	136
4	...	326	3·3	445	3·1	396	2·4	237	1·6	82	1·8	117
5	...	326	3·2	420	3·2	420	2·2	195	1·6	80	1·8	117
6	...	326	3·3	445	3·4	470	2·1	175	1·5	63	1·8	117
7	...	326	3·8	570	3·2	420	2·2	195	1·6	80	1·7	98
8	...	326	4·4	720	3·4	470	2·2	195	1·7	98	1·7	98
9	...	326	4·0	620	3·3	445	2·3	215	1·7	98	1·7	98
10	...	326	3·8	570	3·2	420	2·4	237	1·7	98	1·6	80
11	...	326	3·8	570	3·3	445	2·4	237	1·6	80	1·6	80
12	...	326	3·9	595	3·1	396	2·3	215	1·7	98	1·7	98
13	...	326	4·1	645	3·0	373	2·2	195	1·8	117	1·7	98
14	2·8	326	4·3	695	2·9	350	2·1	175	1·9	136	1·8	117
15	2·8	326	4·6	780	2·8	326	2·0	155	2·0	155	1·9	136
16	2·8	326	4·8	835	2·7	303	1·9	136	2·1	175	1·9	136
17	2·8	326	4·4	720	...	303	1·8	117	2·2	195	1·8	80
18	2·8	326	4·0	620	...	303	1·8	117	2·3	215	1·7	98
19	2·9	350	3·6	520	...	303	1·7	98	2·3	215	1·7	98
20	2·9	350	3·8	570	...	303	1·6	80	2·2	195	1·8	117
21	2·8	326	3·9	595	...	303	1·7	98	2·2	195	1·8	117
22	2·8	326	4·1	645	...	303	1·6	80	2·2	195	1·8	117
23	2·9	350	4·2	670	...	303	1·7	98	2·2	195	1·7	98
24	2·9	350	4·1	645	...	326	1·6	80	2·2	195	1·7	98
25	2·8	326	3·9	595	...	326	1·6	80	2·2	195	1·6	80
26	2·8	326	4·0	620	...	326	1·6	80	2·1	175	1·6	80
27	2·9	350	4·2	670	...	326	1·6	80	2·1	175	1·7	98
28	2·9	350	3·9	595	...	326	1·6	80	2·1	175	1·7	98
29	2·9	350	3·9	595	...	326	1·6	80	2·0	155	1·7	98
30	3·0	373	3·6	520	...	326	1·6	80	2·0	155	1·7	98
31	...	...	3·7	545	...	...	1·6	80	2·0	155	...	...

Monthly Discharge of Anderson River, near Mouth, for 1912.

(Drainage area, 200 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	373	326	333	1·7	1·9	19,800	
May	835	396	589	2·9	3·3	36,200	
June	495	303	364	1·8	2·0	21,700	
July	326	80	154	0·77	0·89	9,470	
August	215	63	141	0·70	0·80	8,670	
September	136	80	106	0·53	0·59	6,300	
The period							50

Note.—Gauge readings were discontinued on September 30, 1912.
Accuracy, "A" and "C."

Barnes Creek (245).

Barnes creek (sometimes called Pennies or Penny's creek) is about 12 miles long and lies in the Dry Belt; it rises in the hills east of Ashcroft at an elevation of 4,000 feet, and discharges into the Thompson river from the south, about four miles east of Ashcroft, at an elevation of 960 feet; the drainage area above the mouth is 38 square miles and above the gauging station about 35 square miles.

Barnes creek is a contentious stream, its waters being used for irrigation, and nearly drying up during July and August, the mean annual precipitation being but 9 inches, and the summers hot and dry; the winters are cold and dry.

The stream is about 12 feet wide and varies in depth from 0·5 to 1·7 feet between low and high water; its mean velocity at high water is 3·5 feet per second.

The discharge fluctuates from practically zero in the winter to a maximum of about 50 or 60 cubic feet per second in the spring freshet during the middle of May; it then declines rapidly, becoming as low as from 3 to 4 second-feet about July 1, remaining at that figure all through that month. In the fall it rises for a short time, then recedes as the cold weather comes on.

Water is diverted from Barnes creek near the head-waters and stored in the Twin lakes for use near Walhachin. There is also a diversion to Barnes lake, from which the water may be returned to Barnes creek for use farther down the stream, or it may be run into Nelson creek for use in that direction. Usually there is a shortage of water on Barnes creek, though in 1912 Barnes lake filled and overflowed, the water users being forced to ask that water be diverted to the Twin lakes, although they had previously taken out an injunction against that diversion.

The gauging station on Barnes creek is 200 yards above Barnes lake and five miles southeast of Ashcroft, B.C.; it was established April 26, 1912, by C. G. Cline. The gauge, which is a 5-foot staff gauge nailed to a small tree on the right bank of the creek, is situated 150 feet above the first highway bridge over the main stream above Barnes lake, and daily gauge readings were taken until the end of the irrigation season. The measurements were made by wading at the downstream side of the bridge. The stream is straight for about 100 feet above the measuring section, and for 50 feet below it, and the water swift. The road has been built up to form the approaches to the bridge, and there is no danger of overflow. There is only one channel, which is about 6 inches deep at ordinary low water. The riffle just below the gauge should be examined occasionally to see that brush and logs do not collect on it and so back the water up on the gauge. This station gives the whole flow of the stream except what is diverted into the Twin lakes near the head-waters of the stream by the British Columbia Horticultural Estates at Walhachin.

Discharge Measurements of Barnes Creek, above Barnes Lake, 1912.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
April 26...	C. G. Cline..................	1046	12	5·7	1·3	0·57	7·4
May 11....	"	1046	12	13·4	3·3	1·0	44·6
June 21....	Cline & Corbould...........	1046	4·5	2·4	1·6	·43	3·8
July 8...	B. Corbould..............	1044	9·5	9·1	2·5	0·75	22·9
July 27....	"	1044	9·5	6·2	1·8	0·6	10·9
Aug. 17....	"	1044	9·5	5·7	1·4	0·51	8·2

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DAILY GAUGE HEIGHT AND DISCHARGE of Barnes Creek, above Barnes Lake for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height	Dis-charge.	Gauge height.	Dis-charge.
	Feet.	Sec-ft.	Feet.	Sec-ft.	Feet.	Sec-ft.	Feet.	Sec-ft.	Feet.	Sec-ft.	Feet.	Sec-ft.
1	......	....	0·75	23	0·6	12	0·55	9·3	0·55	9·3	0·5	6·6
2	......	....	0·8	27	0·55	9·3	0·6	12	0·55	9·3	0·5	6·6
3	......	....	0·85	31	0·5	6·6	0·6	12	0·55	9·3	0·5	6·6
4	......	....	0·85	31	0·5	6·6	0·65	15·5	0·6	12	0·5	6·6
5	......	....	0·9	36	0·45	4·7	0·7	19	0·6	12	0·45	4·7
6	......	....	0·95	40	0·45	4·7	0·7	19	0·55	9·3	0·45	4·7
7	......	....	1·0	45	0·4	2·7	0·75	23	0·5	6·6	0·4	2·7
8	......	....	1·1	54	0·4	2·7	0·75	23	0·5	6·6	0·4	2·7
9	......	....	1·25	68	0·45	4·7	0·7	19	0·5	6·6	0·4	2·[illegible]
10	......	....	1·05	50	0·5	6·6	0·7	19	0·5	6·6	0·4	2·7
11	......	....	1·1	54	0·5	6·6	0·75	23	0·5	6·6	0·4	2·7
12	......	....	1·2	63	0·45	4·7	0·7	19	0·5	6·6	0·4	2·7
13	......	....	1·3	73	0·45	4·7	0·7	19	0·55	9·3	0·35	1·3
14	......	....	1·65	108	0·5	6·6	0·65	15·5	0·55	9·3	0·35	1·3
15	......	....	1·5	93	0·55	9·3	0·6	12	0·55	9·3	......	....
16	......	....	1·45	88	0·5	6·6	0·55	9·3	0·55	9·3	......	....
17	......	....	1·35	78	0·45	4·7	0·5	6·6	0·6	12	......	....
18	......	....	1·3	73	0·4	2·7	0·5	6·6	0·6	12	......	....
19	......	....	1·25	68	0·4	2·7	0·45	4·7	0·6	12	......	....
20	......	....	1·3	73	0·45	4·7	0·45	4·7	0·55	9·3	......	....
21	......	....	1·25	68	0·5	6·6	0·5	6·6	0·55	9·3	......	....
22	......	....	1·35	78	0·55	9·3	0·55	9·3	0·5	6·6	......	....
23	......	....	1·25	68	0·5	6·6	0·55	9·3	0·5	6·6	......	....
24	......	....	1·1	54	0·45	4·7	0·6	12	0·4	2·7	......	....
25	......	....	1·05	50	0·45	4·7	0·7	19	0·4	2·7	......	....
26	0·55	9·3	1·0	45	0·4	2·7	0·7	19	0·4	2·7	......	....
27	0·6	12·0	0·95	40	0·4	2·7	0·6	12	0·4	2·7	......	....
28	0·65	15·5	0·9	36	0·45	4·7	0·65	15·5	0·4	2·7	......	....
29	0·75	23·0	0·85	31	0·5	6·6	0·65	15·5	0·45	4·7	......	....
30	0·75	23·0	0·75	23	0·55	9·5	0·6	12	0·45	4·7	......	....
31	......	....	0·7	19	......	....	0·6	12	0·45	4·7	......	....

MONTHLY DISCHARGE of Barnes Creek, above Barnes Lake, for 1912.

(Drainage area, 35 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per square mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	108	19	54·5	1·6	1·8	3,350	
June	12	2·7	5·7	0·16	0·18	340	
July	23	4·7	14	0·4	0·5	860	
August	12	2·7	7·5	0·21	0·24	461	
The period	......	......	......	......	......	......	10

NOTE.—Barnes Creek Station is maintained during irrigation season only. Winter conditions exist from December to April 1st.
Accuracy, "A" and "C."

Blaeberry River (409).

Blaeberry river rises near the Freshfield group of mountains in Howse pass, near the summit of the Rocky mountains, at an elevation of 4,800 feet, and discharges into Columbia river near Moberly (11 miles northwest of Golden) at an elevation of 2,550 feet. Its drainage area is 325 square miles, and above the falls, a possible site for a small power development, 300 square miles, the water is unused at present, but will probably be utilized for lumbering purposes as well as for power enterprises. Precipitation in the valley varies from 30 inches to 90 inches, and winter conditions are very severe, the river being usually frozen over by the first week in December and not free from ice until the first week in April; in February, 1912, the ice at the mouth of the river was two feet thick and was covered with two feet of snow.

Blaeberry river is between forty and fifty miles long, and is glacial fed; from Mummery glacier alone the Blaeberry receives one-quarter of its water. The Blaeberry valley for about 6 or 8 miles from its mouth is about one mile wide, containing some fair agricultural land not yet taken up. The Canadian Pacific Railway crosses the river about one mile from its mouth, and below the railway the river flows over shifting gravel bars.

Blaeberry river is generally swift, and is not navigable for boats. At the Canadian Pacific Railway bridge, where the Hydrographic Survey station is located, the river is about 50 feet wide and about 3 feet deep at low water, having a mean velocity of 0·4 feet per second; at high water it is 80 feet wide, 6·5 feet deep and has a velocity of nearly 8 feet per second.

There is much valuable timber in the Blaeberry valley—both within and outside the Railway Belt—spruce, fir, cedar and hemlock; none of this timber has been cut, although most of it has been taken up.

There is no cultivation or development of any kind in the valley. About 8 miles from the railway there is a canyon with steep rocky banks from 35 to 50 feet high, the river being from 15 to 30 feet wide; this canyon is about 2 miles long and the river falls 135 feet therein (measured by aneroid). At the head of the canyon, where the river is only 15 feet wide, there is a sheer fall of 20 feet, and between the canyon and the railway, a distance of 8 miles, there is a fall of 350 feet.

Above the falls the river broadens, in some places flowing over gravel bars with numerous side channels; the banks are low, and there are no good natural storage lakes or reservoirs.

The station was established on October 16, 1911, by C. E. Richardson, and was discontinued when ice conditions commenced to prevail on November 8 of that year; in 1912 records were taken from break-up, early in April, to freeze-up, early in November. The Canadian Pacific Railway bridge, three-quarters of a mile from the mouth, is used for taking measurements, while the gauge, a vertical staff gauge 6 feet by 2 inches by 4 inches, graduated in feet and tenths with markings in black paint, is located on the left bank of the stream, fastened to a rock-fill crib in a pool 50 feet below the bridge. The water is well confined to one channel, the bridge abutments constituting the banks of the stream at the measuring section during high water; at low water the stream recedes from the abutments, and borders on the rocks. In high water the channel continually shifts, although riffles just above and below give good control at the station. Three bench-marks have been placed and referred to the gauge datum.

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DISCHARGE MEASUREMENTS of Blaeberry River, at C.P.R. Bridge (one mile from mouth), for 1911.

Date	Hydrographer.	Meter	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Oct. 16	C. E. Richardson	1048	68	177	1·75	0·9	310
1912.							
Feb. 21	"	1047	51	148	0·4		*535
June 6	H. C. Hughes	1055	70	199	2·4	1·4	484
June 7	"	1055	78	237	3·1	1·90	746
June 25	"	1055	86	398	7·3	3·5	2,896
July 11	"	1055	80	293	4·5	2·7	1,327
July 27	"	1055	80	279	4·1	2·43	1,141
Oct. 3	C. E. Richardson	1055	70	215	2·4	1·4	512

*Under ice-cover.

DAILY GAUGE HEIGHT AND DISCHARGE of Blaeberry River at C.P.R. Bridge, for 1911.

DAY.	OCTOBER.		NOVEMBER.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·5	210
2				210
3			0·5	210
4				220
5			0·6	230
6				220
7			0·5	210
8			Freeze up.	
9				
10				
11				
12				
13				
14				
15				
16	0·9	310		
17		300		
18	0·8	280		
19		260		
20	0·6	230		
21		210		
22	0·4	190		
23		170		
24	0·2	150		
25	0·3	170		
26		170		
27		170		
28		170		
29	0·3	170		
30		180		
31	0·4	190		

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	0·9	310	1·7	630	2·7	1,340
2	....	....	1·1	370	....	580	....	1,340
3	....	....	1·15	390	....	530	2·7	1,340
4	....	....	1·2	410	1·4	490	....	1,300
5	....	....	1·2	410	....	490	....	1,290
6	....	....	1·2	410	1·4	490	2·6	1,250
7	....	....	1·2	410	....	700	....	1,210
8	....	....	1·2	410	....	900	....	1,200
9	....	....	1·3	450	....	1,100	2·5	1,160
10	....	....	1·4	490	2·7	1,340	....	1,360
11	....	....	2·3	1,000	....	1,390	2·9	1,570
12	....	....	2·35	1,040	2·8	1,440	....	1,500
13	....	....	2·4	1,080	....	1,720	2·8	1,440
14	....	....	2·43	1,100	3·2	2,100	....	1,440
15	0·9	310	2·46	1,130	3·2	2,100	....	1,440
16	0·9	310	2·5	1,160	....	2,100	2·8	1,440
17	0·9	310	2·4	1,080	3·2	2,100	....	1,390
18	0·95	325	2·3	1,000	....	2,330	2·7	1,340
19	1·0	340	2·15	895	3·4	2,580	....	1,300
20	0·87	304	2·0	800	....	2,890	2·6	1,250
21	0·75	265	2·15	895	....	3,320	....	1,340
22	0·6	230	2·3	1,000	3·7	4,000	....	1,440
23	0·5	210	2·25	965	....	3,600	2·9	1,570
24	0·4	190	2·2	930	....	3,300	....	1,500
25	0·35	180	2·17	910	3·5	2,890	2·8	1,440
26	0·35	180	2·13	880	....	2,580	....	1,300
27	0·3	170	2·1	860	3·3	2,330	2·5	1,160
28	0·3	170	2·05	830	....	1,900		1,200
29	0·3	170	2·0	800	2·8	1,440	2·6	1,250
30	0·5	210	1·9	740	....	1,400	....	1,300
31	....	......	1·8	680	....	....	2·7	1,340

Blaeberry River, at C.P.R. Bridge, for 1912.

August.		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
	1,390	2·3	1,000	1·3	450		320	1
2·8	1,440		990		450		300	2
	1,600		960		450	0·8	280	3
	1,800		940	1·3	450		265	4
3·1	1,900	2·2	930	1·4	490	0·7	250	5
	1,800		860		510		260	6
	1,500	2·0	800	1·5	530		270	7
2·8	1,440		830		490	0·8	280	8
	1,510	2·1	860		490		295	9
2·9	1,570		900	1·3	450	0·9	310	10
	1,290	2·2	930	1·2	410		325	11
2·3	1,000		800		390	1·0	340	12
	1,080		770		390		310	13
2·5	1,160	1·9	740	1·1	370	0·8	280	14
	1,300		800		355			15
2·8	1,440	2·1	860	1·0	340			16
	1,390		830		340			17
2·7	1,340	2·0	800		340			18
	1,440		770	1·0	340			19
	1,620	1·9	740		355			20
3·0	1,720		630	1·1	370			21
	1,910		580		355			22
3·2	2,100	1·4	490		355			23
	3,000		490	1·0	340			24
	3,600	1·4	490		340			25
3·6	3,320		490	1·0	340			26
	2,360		450		325			27
2·8	1,440	1·3	450	0·9	310			28
	1,300		450		325			29
	1,100		450	1·0	340			30
2·2	930			1·0	340			31

MONTHLY DISCHARGE of Blueberry River, at C.P.R. Bridge, for 1912.

(Drainage area, 325 square miles.)

Month.	Maximum	Minimum	Mean.	Per square Mile.	Depth in inches on Drainage area.	Total, in acre feet
April	340	130	200	0·6	0·66	11,900
May	1,160	310	770	2·36	2·7	47,300
June	4,000	490	1,820	5·6	6·2	108,300
July	1,570	1,160	1,350	4·2	4·8	83,000
August	3,600	930	1,670	5·1	5·9	102,700
September	1,000	450	736	2·3	2·6	43,800
October	530	310	391	1·2	1·4	24,000
The period						

40

NOTE.—Ice conditions occurred November 8, 1911. River froze solid about December 25, 1911. Channel opened April 15, 1912. A discharge of 53·5 second-feet was obtained on February 21, 1912, under ice cover. This is about the minimum. Accuracy, "A."

BLUE-EARTH CREEK (262).

Blue-earth creek, a small tributary of Upper Hat creek, in township 19-26-6, rises in Blue-earth lake at an elevation of about 3,800 feet, is about 5 miles long, and discharges into Upper Hat creek from the east.

The drainage area of Blue-earth creek is about 15, and of Blue-earth lake, about 7 square miles.

The following float measurements were made of Blue-earth creek in 1911:—

May 10—Discharge, 1·4 c.f.s.
May 18— " 4·0 c.f.s. (Max.)
June 2— " 1·1 c.f.s.

Blue-earth lake is situated at the head of Blue-earth creek, and is surrounded by high hills; there are, in fact, two lakes of which the upper has an area about one-half that of the lower. The upper lake is 5·7 feet higher than the lower, to which it is connected by a small stream on which there is a beaver dam.

The superficial area of the two lakes at normal water level is 45 acres (by actual traverse survey). The area to the 20-foot contour is 74 acres, and the capacity of the reservoir to that contour is 1,100 acre-feet.

Some years ago a timber-cribbed dam, 20 feet high, was built at the outlet of the lake, the idea being to raise the level of the lake and conduct the water through a cut in the short Twaal creek divide down Twaal creek toward Spence's Bridge; it was afterwards found that the supply of water was insufficient, the average run-off being from 700 to 1,000 acre-feet only per annum. This dam failed two years ago, and has not been reconstructed.

The divide into Twaal creek is 26 feet above Blue-earth lake, and about 200 or 300 yards across.

BOLEAN CREEK (306).

Bolean creek rises in the hills near the head-waters of Chase creek, in township 19, range 13, west of the 6th meridian, at an elevation of 3,000 feet, and empties into Salmon river near Slahaltkan, at an elevation of 1,700 feet. The stream is about 10 miles long, with a drainage area of 80 square miles; it lies at the eastern limit of the dry belt, where the annual precipitation averages about 20 inches, and some irrigation is necessary.

There are some excellent gypsum deposits in this valley.

The station on Bolean creek, which is known also as Currie's creek and, locally, as Six-mile creek, is located half a mile from its mouth. The gauge is a standard vertical staff gauge located on the left bank of Bolean creek, three-quarters of a mile above Falkland post office.

Low-water measurements are made by wading; while in high stages the meter is suspended by a cable from a log across the stream. The banks are two feet high and are well wooded with cedar. The stream is confined to one channel, and there is no chance of overflow. Three bench-marks have been located, and the markings on them refer to the datum of the gauge.

Discharge Measurements of Bolean Creek, near Slahaltkan, for 1911.

Date.	Hydrographer.	Meter No.	Width.	Area of Section.	Mean Velocity.	Gauge Height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911							
May 23	W. M. Carlyle	1044	24	58·5	3·2	2·20	183
June 16	"	1044	24	48·4	2·6	1·95	127
July 12	"	1044	23	34·6	2·5	1·81	87
July 26	"	1044	17	15·4	1·3	1·21	20·3
Aug. 21	"	1044	16	11·8	0·8	1·02	10·1
1912.							
May 13	C. E. Richardson	1048	25	61·2	4·3	2·55	263
July 16	"	1048	23	18·9	1·7	1·39	31·4

DAILY GUAGE HEIGHT AND DISCHARGE of

Day.	May.		June.		July.		August.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·5	251	1·65	68·8	1·10	13·0
2			2·52	256	1·62	64·1	1·08	12·0
3			2·42	232	1·55	54·2	1·05	10·5
4			2·30	204	1·50	47·5	1·05	10·5
5			2·12	163	1·48	45·2	1·05	10·5
6			2·08	154	1·45	41·7	1·05	10·5
7			2·02	140	1·50	47·5	1·40	35·8
8			1·98	132	2·12	163	1·50	47·5
9			2·00	136	2·12	163	1·32	28·4
10			1·95	125	1·95	125	1·22	20·5
11			2·02	140	1·90	114	1·15	16·0
12			2·10	158	1·80	94·8	1·15	16·0
13			2·07	151	1·70	76·5	1·10	13·0
14			2·05	147	1·62	64·1	1·10	13·0
15			2·00	136	1·60	61·0	1·10	13·0
16			1·92	118	1·55	54·2	1·05	10·5
17			1·85	104	1·50	47·5	1·02	9·0
18			1·82	98·6	1·48	45·2	1·00	8·0
19			1·75	85·6	1·45	41·7	0·98	7·3
20			1·70	76·5	1·38	33·9	1·05	10·5
21			1·65	68·8	1·35	31·2	1·02	9·0
22			1·68	73·4	1·35	31·2	1·05	10·5
23	2·2	181	1·68	73·4	1·35	31·2	1·05	10·5
24	2·15	170	1·60	61·0	1·32	28·4	1·00	8·0
25	2·12	163	1·58	58·3	1·28	25·0	0·98	7·3
26	2·08	154	1·58	58·3	1·25	22·8	0·95	6·2
27	2·05	147	1·70	76·5	1·22	20·5	0·95	6·2
28	2·05	147	1·62	64·1	1·18	17·8	0·92	5·2
29	2·10	158	1·58	58·3	1·15	16·0	0·90	4·5
30	2·22	186	1·58	58·3	1·12	14·2	0·90	4·5
31	2·35	216	....	....	1·10	13·0	0·90	4·5

SESSIONAL PAPER No. 25f

Bolean Creek, near Slahaltkan, for 1911.

September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
0·85	3·1	1·10	13·0	0·90	4·5	1·15	16·0	1
0·85	3·1	1·05	10·5	0·90	4·5	1·15	16·0	2
0·88	4·0	1·05	10·5	0·92	5·2	1·05	10·4	3
1·12	14·2	1·05	10·5	1·05	10·5	1·05	10·4	4
1·18	17·8	1·00	8·0	1·05	10·5	1·05	10·4	5
1·08	12·0	1·00	8·0	1·02	9·0	1·05	10·4	6
1·05	10·5	1·00	8·0	1·05	10·5	1·05	10·4	7
1·02	9·0	0·98	7·3	1·05	10·5	1·05	10·4	8
0·98	7·3	0·95	6·2	1·10	13·0	1·10	13·0	9
0·95	6·2	0·95	6·2	1·05	10·5	1·10	13·0	10
0·92	5·2	0·95	6·2	1·05	10·5	1·10	13·0	11
0·90	4·5	0·92	5·2	1·00	8·0	1·05	10·4	12
1·05	10·5	0·90	4·5	0·95	6·2	1·05	10·4	13
1·42	38·1	1·05	10·5	0·95	6·2	1·10	13·0	14
1·32	28·4	1·05	10·5	0·95	6·2	1·05	10·4	15
1·30	26·5	1·05	10·5	1·00	8·0	1·05	10·4	16
1·20	19·0	1·05	10·5	1·08	12·0	1·05	10·4	17
1·15	16·0	1·00	8·0	1·22	20·5	1·10	13·0	18
1·12	14·2	1·00	8·0	1·25	22·8	1·10	13·0	19
1·10	13·0	1·00	8·0	1·20	19·0	1·10	13·0	20
1·10	13·0	0·98	7·3	1·15	16·0	1·07	11·6	21
1·08	12·0	0·95	6·2	1·10	13·0	1·05	10·4	22
1·05	10·5	0·95	6·2	1·15	16·0	1·05	10·4	23
1·05	10·5	1·05	10·5	1·15	16·0	1·05	10·4	24
1·05	10·5	1·02	9·0	1·2	19·0	1·15	16·0	25
1·05	10·5	1·00	8·0	1·2	19·0	1·15	16·0	26
1·00	8·0	0·95	6·2	1·2	19·0	1·15	16·0	27
1·05	10·5	0·95	6·2	1·2	19·0	1·25	22·8	28
1·08	12·0	0·95	6·2	1·4	35·8	1·15	16·0	29
1·10	13·0	0·95	6·2	1·1	13·0	1·05	10·4	30
		0·90	4·5			1·05	10·4	31

MONTHLY DISCHARGE of Bolean Creek, near Slahaltkan, for 1911.

(Drainage area, 80 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June....	256	58·3	122	1·52	1·7	7,260	
July....	163	13	55	0·7	0·8	3,382	
August	47·5	4·5	12·6	0·16	0·18	775	
September	38	3·1	12·4	0·15	0·17	738	
October	13	4·5	8·0	0·1	0·1	492	
November........	35·8	4·5	13·1	0·16	0·18	780	
December	22·8	10·4	12·5	0·16	0·18	769	
The period							16

NOTE. Accuracy "A", except during the month of December, when the discharges are probably slightly in excess of the true amounts.

Bolean Creek, near Grande Prairie, B. C.

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	January. Gauge height.	January. Discharge.	February. Gauge height.	February. Discharge.	March. Gauge height.	March. Discharge.	April. Gauge height.	April. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·05	10·4	1·05	10·4	1·00	8·0	1·15	16·0
2	1·10	13·0	1·10	13·0	1·00	8·0	1·22	20·9
3	1·05	10·4	1·10	13·0	1·00	8·0	1·27	24·6
4	1·00	8·0	1·10	13·0	1·00	8·0	1·22	20·9
5	1·00	8·0	1·05	10·4	1·00	8·0	1·20	19·0
6	1·00	8·0	1·05	10·4	1·00	8·0	1·27	24·6
7	1·00	8·0	1·05	10·4	1·00	8·0	1·27	24·6
8	1·00	8·0	1·10	13·0	1·00	8·0	1·27	24·6
9	1·05	10·4	1·10	13·0	1·00	8·0	1·32	28·8
10	1·05	10·4	1·10	13·0	1·00	8·0	1·32	28·8
11	1·05	10·4	1·10	13·0	0·95	6·3	1·37	33·4
12	1·05	10·4	1·10	13·0	0·95	6·3	1·57	57·7
13	1·07	11·6	1·05	10·4	0·95	6·3	1·57	57·7
14	1·12	14·5	1·05	10·4	0·95	6·3	1·60	61·0
15	1·15	16·0	1·05	10·4	0·9	4·5	1·60	61·0
16	1·10	13·0	1·05	10·4	0·95	6·3	1·60	61·0
17	1·05	10·4	1·05	10·4	0·95	6·3	1·62	64·9
18	1·05	10·4	1·10	13·0	1·00	8·0	1·60	61·0
19	1·05	10·4	1·10	13·0	1·00	8·0	1·62	64·9
20	1·05	10·4	1·05	10·4	1·00	8·0	1·62	64·9
21	1·05	10·4	1·05	10·4	1·00	8·0	1·62	64·9
22	1·05	10·4	1·05	10·4	1·00	8·0	1·65	68·8
23	1·00	8·0	1·05	10·4	1·00	8·0	1·67	72·7
24	1·00	8·0	1·05	10·4	1·00	8·0	1·70	76·5
25	1·05	10·4	1·05	10·4	1·00	8·0	1·70	76·5
26	1·05	10·4	1·00	8·0	1·00	8·0	1·75	85·7
27	1·05	10·4	1·00	8·0	1·05	10·4	1·75	85·7
28	1·10	13·0	1·00	8·0	1·10	13·0	1·75	85·7
29	1·10	13·0	1·00	8·0	1·10	13·0	1·80	94·8
30	1·15	16·0	....	....	1·07	11·6	·95	125·
31	1·10	13·0	....	....	1·10	13·0	....	....

SESSIONAL PAPER No. 25f

Bolean Creek, near Slahaltkan, for 1912.

May.		June.		July.		August.		September.		Day.
Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
1·90	114	2·37	221	1·55	54·3	1·15	16·0	1·37	33·4	1
1·90	114	2·37	221	1·57	57·7	1·10	13·0	1·40	35·8	2
1·97	130	2·25	192	1·77	90·3	1·12	14·5	1·47	44·5	3
2·05	147	2·22	187	1·65	68·8	1·15	16·0	1·42	38·7	4
2·12	164	2·20	181	1·60	61·0	1·12	14·5	1·35	31·1	5
2·20	181	2·17	175	1·60	61·0	1·07	11·6	1·32	28·8	6
2·22	187	2·20	181	1·67	72·7	1·05	10·4	1·45	41·6	7
2·47	245	2·25	192	1·62	64·9	1·05	10·4	1·50	47·5	8
2·62	282	2·22	187	1·55	54·3	1·02	9·2	1·45	41·6	9
2·55	263	2·15	169	1·52	50·9	1·00	8·0	1·40	35·8	10
2·52	257	2·10	158	1·50	47·5	1·05	10·4	1·32	28·8	11
2·55	263	2·12	164	1·52	50·9	1·10	13·0	1·35	31·1	12
2·57	269	2·20	181	1·55	54·3	1·07	11·6	1·30	26·5	13
2·85	342	2·20	181	1·52	50·9	1·05	10·4	1·30	26·5	14
3·00	382	2·47	245	1·47	44·5	1·07	11·6	1·30	26·5	15
3·10	412	2·50	251	1·40	35·8	1·15	16·0	1·25	22·5	16
2·92	362	2·25	192	1·40	35·8	1·20	19·0	......	....	17
2·82	335	2·10	158	1·35	31·1	1·30	26·5	......	....	18
2·82	335	2·02	141	1·35	31·1	1·25	22·8	......	....	19
2·92	262	2·00	136	1·30	26·5	1·20	19·0	......	....	20
3·00	382	1·87	109	1·30	26·5	1·20	19·0	......	....	21
2·92	362	1·77	90·3	1·30	26·5	1·15	16·0	......	....	22
2·92	362	1·67	72·7	1·27	24·6	1·15	16·0	......	....	23
3·00	382	1·60	61·0	1·27	24·6	1·12	14·5	......	....	24
2·90	355	1·55	54·3	1·40	35·8	1·20	19·0	......	....	25
2·95	369	1·55	54·3	1·35	31·1	1·15	16·0	......	....	26
2·87	349	1·55	54·3	1·35	31·1	1·15	16·0	......	....	27
2·75	315	1·55	54·3	1·30	26·5	1·10	13·0	......	....	28
2·57	269	1·50	47·5	1·25	22·8	1·15	16·0	......	....	29
2·50	251	1·50	47·5	1·22	20·9	1·27	24·6	......	....	30
2·45	239	....	....	1·17	17·5	1·25	22·8	......	....	31

MONTHLY DISCHARGE of Bolean Creek, near S'ahaltkan, for 1912.

(Drainage area, 80 square miles.)

Month	Discharge in Second Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	16·0	8·0	10·8	0·14	0·15	664	
February	13·0	8·0	11·0	0·14	0·15	633	
March	13·0	4·5	8·2	0·10	0·11	504	
April	125	16·0	55·2	0·69	0·77	3,285	
May	412	114	283	3·54	4·08	17,400	
June	251	47·5	145	1·81	2·02	8,630	
July	90	17·5	43	0·54	0·62	2,644	
August	26·5	8·0	15·4	0·19	0·22	947	
September	47·5		25·0	0·31	0·35	1,490	
October			*10·	0·12	0·14		
November			*10·	0·12	0·14	2,000	
December			*10·	0·12	0·14		
The year	412	4·5	52·2	0·65	8·89	38,197	18

NOTE.—Discharges from December 1911 to March 1912, were deduced from a summer curve, and as winter conditions existed they are probably in excess (slightly) of the true discharges. The station was discontinued on September 12.

*The estimated mean flow of October, November and December is 10 second-feet.

Accuracy "A," except for month of April when it is "B."

BONAPARTE RIVER (215).

Bonaparte river rises in Bonaparte lake at an elevation of 3,800 feet, and discharges into Thompson river near Ashcroft at an elevation of 970 feet; Hat creek and Maiden creek (Graves creek) flow in from the west, Cache creek and Scottie creek from the east, the total discharge area being 2,000 square miles. The water is used for irrigation and for water-power. An attempt was made at the power plant of the Ashcroft Water, Electric and Improvement Company to pump water to the Boston flat, using power obtained from the river; owing to the high elevation to which the water had to be raised, too large a flow of water was required to supply the power, therefore the scheme was not successful.

The Bonaparte drains a large watershed lying between the Fraser and the North Thompson, and at the head-waters of several of its branches there are lakes varying in elevation from 2,000 to 3,000 feet; the largest of these is Bonaparte lake, which is about ten miles long and two miles wide.

Near Ashcroft, the Bonaparte has worn a canyon, through which it flows for three miles or so; near the upper end of this canyon the power-house which supplies Ashcroft with power and light is situated; although there are other sites in the canyon, it is doubtful whether there will be much more power development on the stream as the water is in demand for irrigation.

Below the canyon there is some good land; the bottom land is being cultivated and irrigated, but the higher benches are arid. About six miles from the mouth of the river, the valley broadens out, and for fifteen miles there is a fine stretch of good country. The Cariboo road runs up the valley and a good deal of the land was taken up in the early days of the province; even now the traffic on this road to Fort George and the northern interior is the largest factor in the prosperity of the Bonaparte valley; passengers are carried by automobiles and make the run through to the boat landing at Soda creek on the Upper Fraser in one day. Freighting is still done entirely by horses and wagons, travelling about twenty miles a day, and furnishing a good demand for hay and oats.

The Bonaparte valley is in the dry belt; during the growing season there is almost continuous sunshine, with very little rain, and consequently nothing will grow without irrigation; the soil is naturally rich, and when water is supplied the growth is rapid. At present most of the lower land in the Bonaparte and tributary valleys is under cultivation, and the water supply is about sufficient under the present methods of irrigation. There is much good land, however, on the higher benches in the Scmlin valley, and on the Boston flat, which could be irrigated by a long flume from the Bonaparte river and, if the storage on the lakes were utilized, there would be sufficient water, and if one system were constructed to serve all the price per acre would not be excessive.

Potatoes do exceptionally well on this land. Ashcroft potatoes have quite a reputation, and bring the highest prices. In the summer, large herds of cattle feed on the good pasturage on the hills, but as they must be fed during the winter there is good market for hay; thus, even now, the Ashcroft district is a good farming country, and could be much improved by an extensive irrigation system.

Twenty miles from the mouth of the river, quite near the boundary of the Railway Belt, the wagon road leaves the Bonaparte valley and climbs to the plateau, the best part of the valley being inside this belt. North of the boundary the altitude is higher, the precipitation somewhat heavier, and there is more timber. It is in this part of the watershed that all the lakes lie; there is splendid fishing in many of them and Indians go up there every fall in large numbers to catch fish for the winter. The Cariboo road does not touch the main stream outside the Railway Belt, and the only means of travelling is by pack trail.

The gauging station on the Bonaparte is at Mr. J. G. Collin's ranch, about six miles from the mouth of the stream, above the Ashcroft power-house, and not far from the upper end of the canyon. The gauge is a five-foot vertical staff nailed to some small trees on the right bank of the stream at Collin's house, and is referred to three bench-marks so that any change of elevation can be detected and corrected.

The meter measurements are made at a section about 100 feet above the gauge, where a wire has been stretched across the stream; at high water a carrier is put on this wire and the meter suspended from it by a cable, while at low and medium stages the measurements are made by wading. The channel above the section is straight for 100 feet, and the water is swift; below, the channel is straight for 150 feet and the water, though obstructed by one or two boulders, swift.

The right bank is two feet high, with a fringe of bushes and small trees, and at very high stages the water might rise into the bushes; the left bank is four feet high and covered with bushes and trees; there could be only one channel even at high water. The bed of the stream is rocky, and the water is about two feet deep at ordinary stages; at the highest stages it is impossible to wade it; at very low water it might be necessary to remove a few shovelfuls of mud to keep open the communication between the little pool in which the gauge is placed and the main stream, though at ordinary stages the gauge is in the main stream itself.

DISCHARGE MEASUREMENTS of Bonaparte River, five miles from mouth, for 1911 and 1912.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1911.							
June 10	C. G. Cline	1046	62	109	3·3	2·25	364
July 14	"	1040	50	81	2·2	1·49	177
Sept. 26	Cline and Smith	1046	37	40	1·7	0·99	67
Sept. 26	"	1046	37	40·5	1·7	0·99	70
1912.							
April 24	C. G. Cline	1046	46	78·6	2·9	1·57	226
May 9	"	1046	52	153·	4·9	3·10	756
June 16	Cline and Corbould	1046	45	93·	3·2	1·95	297
July 17	B. Corbould	1044	....	....	....	1·65	229
July 30	"	1044	50	100	2·8	1·70	289
August 26	"	1044	43	79	2·3	1·35	186
Oct. 3	C. G. Cline	1046	38	48	1·8	1·08	87

DAILY GAUGE HEIGHT AND DISCHARGE of Bonaparte River, five miles from mouth for 1911.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·6	207	1·15	102	0·75	25	0·95	59	0·9	50
2			1·6	207	1·15	102	0·7	18	0·95	59	0·9	50
3			1·6	207	1·15	102	0·7	18	0·95	59	0·9	50
4			1·6	207	1·1	90	0·75	25	0·95	59	0·9	50
5			1·6	207	1·1	90	0·75	25	0·95	59	0·9	50
6			1·55	195	1·1	90	0·75	25	0·9	50	0·9	50
7			1·55	195	1·05	79	0·75	25	0·9	50	....	....
8			1·55	195	1·15	102	0·75	25	0·9	50	....	....
9			1·55	195	1·05	79	0·75	25	0·9	50	....	....
10	2·25	375	1·55	195	1·05	79	0·75	25	0·85	42	....	....
11	2·25	375	1·5	183	1·0	68	0·75	25	0·85	42	....	....
12	2·3	390	1·5	183	1·0	68	0·75	25	0·85	42	....	....
13	2·35	405	1·5	183	1·0	68	0·75	25	0·85	42	....	....
14	2·35	405	1·5	183	0·95	59	0·9	50	0·85	42	....	....
15	2·3	390	1·45	171	0·95	59	0·95	59	0·85	42	....	....
16	2·2	260	1·45	171	0·95	59	1·0	68	0·85	42	....	....
17	2·15	345	1·45	171	0·95	59	1·05	79	0·9	50	....	....
18	2·0	305	1·4	159	0·9	50	1·05	79	0·9	50	....	....
19	2·0	305	1·4	159	0·9	50	1·05	79	0·9	50	....	....
20	1·9	280	1·4	159	0·9	50	1·05	79	0·9	50	....	....
21	1·8	256	1·4	159	0·85	42	1·0	68	0·9	50	....	....
22	1·8	256	1·4	159	0·85	42	1·0	68	0·9	50	....	....
23	1·7	232	1·35	148	0·85	42	1·0	68	0·9	50	....	....
24	1·7	232	1·35	148	0·85	42	1·0	68	0·9	50	....	....
25	1·7	232	1·3	136	0·85	42	1·0	68	0·9	50	....	....
26	1·7	232	1·3	136	0·8	33	1·0	68	0·9	50	....	....
27	1·7	232	1·3	136	0·8	33	1·0	68	0·9	50	....	....
28	1·65	220	1·25	124	0·8	33	1·0	68	0·9	50	....	....
29	1·65	220	1·25	124	0·75	25	1·0	68	0·9	50	....	....
30	1·6	207	1·2	113	0·75	25	0·95	59	0·9	50	....	....
31	..		1·2	113	0·75	25	....	....	0·9	50	..	

MONTHLY DISCHARGE of Bonaparte River, five miles from mouth, for 1911.

(Drainage area, 2,000 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	405	207	284	0·14	0·16	16,900	
July	207	113	169	0·08	0·09	10,400	
August	102	25	61	0·03	0·04	3,750	
September	79	18	50·6	0·025	0·03	3,010	
October	59	42	49·6	0·025	0·03	3,050	
The period				..	...	....	10

NOTE.—Station established June 10, 1911.
Accuracy, "C."

DAILY GAUGE HEIGHT AND DISCHARGE of Bonaparte

Day.	March.		April.		May.		June.		July.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.			1·2	113	2·7	535	2·7	535	1·75	244
2			1·25	125	2·8	580	2·65	515	1·8	256
3.			1·3	136	2·85	605	2·65	515	1·9	280
4			1·25	125	2·9	630	2·65	515	2·0	305
5			1·2	113	2·9	630	2·5	455	2·05	317
6			1·2	113	2·95	660	2·4	420	2·0	305
7			1·1	90	3·0	690	2·3	390	1·9	280
8			1·15	102	3·05	720	2·25	375	1·85	268
9			1·2	113	3·1	755	2·2	360	1·8	256
10			1·15	102	3·15	795	2·2	360	1·8	256
11			1·2	113	3·2	830	2·15	345	1·75	244
12			1·2	113	3·15	795	2·15	345	1·75	244
13			1·25	125	3·15	795	2·1	330	1·8	256
14			1·25	125	3·2	830	2·0	305	1·8	256
15			1·25	125	3·15	795	1·95	292	1·75	244
16			1·2	113	3·1	755	1·9	280	1·7	232
17			1·1	90	3·1	755	1·9	280	1·7	232
18			1·15	102	3·0	690	1·9	280	1·65	220
19			1·25	125	2·9	630	1·85	268	1·6	207
20			1·2	113	2·9	630	1·85	268	1·6	207
21			1·25	125	2·95	660	1·9	280	1·55	195
22			1·25	125	2·9	630	1·85	268	1·6	207
23			1·4	159	2·85	605	1·8	256	1·65	220
24			1·6	207	2·85	605	1·8	256	1·75	244
25	0·8	33	1·8	256	2·9	630	1·75	244	1·85	268
26	0·85	42	2·1	330	2·9	630	1·75	244	1·8	256
27	0·85	42	2·3	390	2·9	630	1·75	244	1·75	244
28	0·9	50	2·6	495	2·85	605	1·8	356	1·75	244
29	0·95	59	2·5	455	2·85	605	1·85	268	1·7	232
30	1·05	73	2·6	495	2·85	605	1·85	268	1·7	232
31	1·1	90			2·75	560			1·65	220

River, five miles from mouth for 1912.

August.		September.		October.		November.		December.		Day
Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
1·6	207	1·35	148	1·1	90	1·17	106	1·05	79	1
1·6	207	1·35	148	1·1	90	1·17	106	1·05	79	2
1·55	195	1·4	159	1·1	90	1·17	106	1·05	79	3
1·55	195	1·4	159	1·1	90	1·17	106	1·05	79	4
1·5	183	1·45	171	1·1	90	1·15	102	1·1	90	5
1·45	171	1·5	183	1·1	90	1·15	102	1·1	90	6
1·45	171	1·5	183	1·1	90	1·15	102	1·05	79	7
1·45	171	1·5	183	1·1	90	1·15	102	1·05	79	8
1·45	171	1·5	183	1·15	102	1·15	102	1·05	79	9
1·4	159	1·45	171	1·15	102	1·15	102	1·05	79	10
1·4	159	1·45	171	1·15	102	1·15	102	1·07	83	11
1·4	159	1·45	171	1·2	113	1·15	102	1·07	83	12
1·4	159	1·4	159	1·2	113	1·15	102	1·1	90	13
1·4	159	1·4	159	1·2	113	1·1	90	1·1	90	14
1·45	171	1·35	148	1·2	113	1·1	90	1·1	90	15
1·5	183	1·35	148	1·2	113	1·1	90	1·1	90	16
1·5	183	1·3	136	1·2	113	1·1	90	1·07	83	17
1·5	183	1·25	125	1·2	113	1·1	90	1·07	83	18
1·45	171	1·25	125	1·2	113	1·12	95	1·07	83	19
1·45	171	1·2	113	1·2	113	1·12	95	1·1	90	20
1·45	171	1·2	113	1·2	113	1·1	90	1·1	90	21
1·4	159	1·2	113	1·2	113	1·1	90	1·1	90	22
1·4	159	1·15	102	1·2	113	1·07	83			23
1·4	159	1·15	102	1·2	113	1·07	83			24
1·35	148	1·15	102	1·2	113	1·07	83			25
1·35	148	1·1	90	1·2	113	1·07	83			26
1·35	148	1·1	90	1·2	113	1·05	79			27
1·35	148	1·1	90	1·2	113	1·05	79			28
1·35	148	1·1	90	1·17	106	1·05	79			29
1·3	136	1·1	90	1·17	106	1·05	79			30
1·3	136			1·17	106					31

MONTHLY DISCHARGE of Bonaparte River, five miles from mouth, for 1912.

(Drainage area, 2,000 square miles.)

Month	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	495	90	177	0·09	0·10	10,500	
May	830	535	673	0·33	0·38	41,400	
June	535	244	334	0·17	0·19	19,900	
July	317	195	247	0·12	0·14	15,200	
August	207	130	167	0·08	0·09	10,300	
September	183	90	137	0·07	0·08	8,150	
October	113	90	105	0·05	0·06	6,460	
November	106	79	93	0·05	0·06	5,530	
December	90	79	84	0·04	0·05	5,165	
The period							10

NOTE.—Accuracy, "C."

BOTANIE CREEK (205).

Botanie creek has its source in Botanie lake (in Botanie I.R., No. 15), in township 16, range 26, west of the 6th meridian, at an elevation of 3,500 feet, and discharges into Thompson river, 3 miles from Lytton, at an elevation of 650 feet. Botanie creek lies within the Dry Belt, is about nine or ten miles long and flows in a southerly direction. Its drainage area above the mouth is 38 square miles, and the annual precipitation is only about 10 inches; the water is used for irrigation and domestic purposes.

There are about 400 acres of land that can be easily irrigated from Botanie creek; this consists of bench land, the soil of which is good consisting of heavy sandy loam with clay subsoil. These benches are in some cases 200 to 300 feet above the creek, but owing to the steep slope of the creek long ditches are not required.

There are a number of old water records for Botanie creek for irrigation purposes amounting to about 850 miner's inches, but this amount of water is unnecessary for the land under cultivation or for the total amount of irrigable land appurtenant to the records.

To increase the flow of Botanie creek, which falls very low during July and August, the Indians have diverted water from the creek into Botanie lake, where there is an excellent site for a Skoonko storage dam; this lake has an area of 60 acres and a twelve-foot dam would store 720 acre-feet of water. Botanie creek has a fall of about 300 feet to the mile for 9 miles and, with a small pipe line, about 100 horse-power could be developed during the irrigation season, but the water would have to be regulated for the irrigation requirements, which are paramount.

The station, which was established on September 21, 1911, by C. E. Richardson is, above all diversions, some 5 miles below Botanie lake and 7 miles from the town of Lytton. Weekly gauge readings were taken to the end of November, in 1911, and from April 1 to September 10 in 1912.

The gauge is a vertical staff gauge (cedar), 2 inches by 4 inches by 6 feet, marked in feet and tenths, and measurements are made by wading. The stream is swift, its bed rocky, and although confined to one channel a smooth stretch of water for a measuring section was hard to find.

DISCHARGE MEASUREMENTS of Botanie Creek, above diversions, for 1911 and 1912

Date	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity	Gauge height	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
1911							
Sept. [illegible]	E. R. [illegible]	[illegible]	[illegible]	4.4	0.94	[illegible]	4.2
1912							
May 29	B. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.62	14.[illegible]

DAILY GAUGE HEIGHT AND DISCHARGE of Botanie Creek, above diversions, for 1911

Day	September		October		November	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			[illegible]	2.6		[illegible]
2				2.8	1.3	[illegible]
3				3.0		
4				[illegible]		[illegible]
5				[illegible]		[illegible]
6				[illegible]		
7				3.2		
8				3.3		
9				3.4		[illegible]
10				3.5	1.3	[illegible]
11				3.5		[illegible]
12			1.3	3.6		[illegible]
13				3.6		3.1
14				3.6		3.0
15				3.6		2.9
16				3.6		2.8
17				3.6		2.7
18				3.6	1.25	2.6
19			1.3	3.6		2.7
20				3.6		2.8
21	1.3	3.6		3.6		2.9
22				3.6		3.0
23		..		3.6		3.2
24				3.6		3.4
25				3.6	1.3	3.6
26			1.3	3.6		3.6
27				3.6		3.6
28	1.3	3.6		3.6		3.6
29				3.6		3.6
30				3.6		3.6
31				3.6		

MONTHLY DISCHARGE of Botanic Creek, above diversions, for 1911.

(Drainage area, 38 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
October	3·8	2·6	3·4	·09	·10	209	
November	3·8	2·6	3·3	·09	·10	196	
The period							·10

NOTE.—Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of Botanic Creek, above diversions, for 1912.

Day.	April.		May.		June.		July.		August.		Septem.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		3·6		12·6		10·2		6·2	1·3	3·6		
2		3·6		12·9		9·2		6·2		3·6		
3		3·6		13·2		8·2	1·4	6·2		3·6		
4		3·6	1·6	13·5		7·2		6·2		3·6		
5		3·6		14·4	1·4	6·2		6·2		3·6		
6	1·3	3·6		15·3		6·2		6·2		3·6		
7		3·6		16·2		6·2		6·2	1·3	3·6		
8		3·6		17·1		6·2		6·2		3·6		
9		3·6	1·7	17·9		6·2		6·2		3·6		
10	1·3	3·6		18·2		6·2	1·4	6·2		3·6	1·25	2·6
11		4·1		18·5		6·2		6·2		3·6		
12		4·6		18·8	1·4	6·2		5·8	1·3	3·6		
13		5·1		19·2		6·2		5·4		3·8		
14		5·6		19·6		6·2		5·0		4·0		
15	1·4	6·2	1·75	20·1		6·2		4·6		4·2		
16		6·7		20·4		6·2		4·1		4·4		
17		7·2		20·7		6·2	1·3	3·6		4·6		
18		7·9		21·1		6·2		3·6	1·35	4·9		
19		8·2		21·5		6·2		3·6		4·8		
20		8·7		21·9		6·2		3·6		4·6		
21		9·2	1·8	22·3		6·2		3·6		4·4		
22	1·5	9·6		21·2		6·2		3·6		4·2		
23		10·0		20·1		6·2	1·3	3·6		4·0		
24		10·4		19·0		6·2		3·6		3·8		
25		10·8		17·9		6·2		3·6	1·3	3·6		
26		11·2		16·8		6·2		3·6		3·4		
27	1·55	11·6		16·7		6·2		3·6		3·2		
28		11·8		16·6		6·2	1·3	3·6		3·1		
29		12·0	1·6	13·5		6·2		3·6		3·0		
30		12·3		12·4		6·2		3·6		2·8		
31				11·3				3·6	1·25	2·6		

MONTHLY DISCHARGE of Botanie Creek, above diversions, for 1912.

(Drainage area, 38 square miles.)

Month	Discharge in Second-Feet				Run-Off		Rain-fall
	Maximum	Minimum	Mean	Per sq. mile	Depth in inches on Drainage area	Total in acre-feet	Inches
April	12.3	3.6	6.9	0.18	0.20	410	
May	22.3	11.3	17.4	0.46	0.53	1,070	
June	10.2	6.2	6.5	0.17	0.19	387	
July	6.2	3.6	4.7	0.12	0.14	289	
August	4.9	2.6	3.8	0.10	0.11	234	
The period							10

NOTE.—Station maintained during irrigation season only.
Accuracy "B" and "C."

BUGABOO CREEK (119).

Bugaboo river, with a drainage area of 194 square miles, lies in the Upper Columbia district and has its source in the Selkirk mountains at an elevation of 6,000 feet to 9,000 feet, discharging into Columbia river near Spillimacheen Landing, at an elevation of 2,600 feet; the precipitation near the source in average years is very heavy, probably 60 inches, while near the mouth it is only about 10 inches.

Bugaboo river behaves in a similar manner to Spillimacheen river, which empties into the Columbia a few miles below the mouth of the Bugaboo. (See notes re drainage and run-off of Spillimacheen river.)

Bugaboo river is a mountain torrent. At the highway bridge, about one mile from its mouth, it is about 60 feet wide and 3 feet deep at high water, having a mean velocity of 6 feet per second. At low water it is 23 feet wide, 6 inches deep and has a mean velocity of 2 feet per second.

For the first mile above the mouth there is flooding at the high-water season of Columbia river. At a point 2 miles from the mouth, a canyon 1 mile long begins and the fall in that distance is 220 feet (measured by aneroid). At the head of the canyon there is a sheer fall of 60 feet, making a total of 280 feet. The river at the foot of the canyon is 50 feet wide, with precipitous banks rising 60 feet above the water, and at the head of the falls the river is 40 feet, with steeply sloping banks. There is no good storage lake or natural reservoir on Bugaboo river. The stream is used for log-driving, but there are no other important interests at present, although there are possible future uses of the water for power and mining.

The run-off of Bugaboo river is of importance during the winter low-water period in connection with water-power purposes, while the flood discharge has been studied in connection with the possible reclamation of the overflow bottom lands of the Upper Columbia valley from Golden to lake Windermere. The station on the Bugaboo was established by H. C. Hughes on June 1, 1912. Continuous gauge readings were taken till October 31, 1912, after which ice conditions began to prevail.

The measuring section is located one mile from the mouth on the downstream side of the traffic bridge carrying the highway, which runs along the west bank of the Columbia, from Spillimacheen to Wilmer. The gauge, a standard vertical staff gauge, is nailed on the bridge pier nearest the right shore. The flow is measured by a current meter suspended by a cable from the bridge. The bed of the stream is rough and rocky, and its banks low and bushy; at high water there are two channels, and at extremely high water the banks are liable to overflow. Three bench-marks have been located and referred to the gauge datum.

DISCHARGE MEASUREMENTS of Bugaboo River, near Spillimacheen, for 1912.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
June 1.....	H. C. Hughes.......	1055	23	96	2·9	1·45	280
June 18.....	" "	1055	60	130	6·1	2·40	840
July 16....	" "	1055	59	128	5·3	2·15	684
Sept. 24.	C. E. Richardson	1055	23	86	1·9	1·02	160

DAILY GAUGE HEIGHT AND DISCHARGE of Bugaboo River, near Spillimacheen, for 1912.

Day.	June.		July.		August.		September.		October.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1....	1·45	280	2·10	630	2·35	810	1·50	300	0·95	148
2.....	1·40	260	2·30	770	2·25	735	1·45	280	1·05	165
3....	1·32	236	2·15	665	2·25	735	1·40	260	10·5	165
4	1·30	230	2·00	560	2·25	735	1·30	230	1·00	155
5. ...	1·35	245	2·25	735	2·20	700	1·37	251	0·95	148
6.	1·45	280	2·25	735	1·95	530	1·30	230	1·10	175
7.....	1·70	390	2·30	770	1·95	530	1·35	245	1·10	175
8.....	2·10	630	2·35	810	2·00	560	1·37	251	0 95	148
9.....	2·55	970	2·30	770	2·25	735	1·35	245	1·00	155
10.....	2·20	700	2 30	770	2·15	665	1·37	251	1·00	155
11....	2·55	970	2·35	810	2·05	595	1·37	251	0·98	152
12....	2·4	850	2·20	700	2·00	560	1·55	320	0·90	140
13 ..	2·50	930	2·85	1,210	1·85	470	1·60	340	0·90	140
14	2·35	810	2·60	1,010	1·85	470	1·35	245	0·90	140
15. ...	2·15	665	2·35	810	2·05	595	1·25	215	0·90	140
16	2·10	630	2·35	810	2·10	630	1·22	206	1·05	165
17 ..	2 35	810	2·10	630	1·90	500	1·27	221	1·35	245
18.....	2·60	1,010	2·15	665	1·75	415	1·27	221	1·15	188
19. ...	2·65	1,050	2·30	770	1·80	440	1·15	188	1·05	165
20.....	2·75	1,130	2·30	770	1·85	470	1·30	230	0·95	148
21....	2·75	1,130	2·25	735	2·05	595	1·35	245	0·95	148
22. ..	3·10	1,430	2·25	735	2·15	665	1·35	245	1·00	155
23 ..	3·05	1,380	2·20	700	2·30	770	1·25	215	0·98	152
24	3·00	1,340	2·20	700	2·25	735	1·15	188	0·90	140
25..	2·90	1,250	2·10	630	2·30	770	1·30	230	0·92	143
26..	2·90	1,250	2·10	630	2·00	560	1·07	169	0·85	135
27...	2·75	1,130	2·05	595	1·90	500	1·00	155	0·78	129
28....	2·45	890	2·10	630	1·95	530	1·30	230	·070	123
29....	2·15	665	2·20	700	1·75	415	1·00	155	0·70	123
30....	2·10	630	2·30	720	1·60	340	1·05	165	0·60	118
31.........			2·35	810	1·50	300			0·60	118

MONTHLY DISCHARGE of Bugaboo River, near Spillimacheen, for June to October, 1912.
(Drainage area, 190 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	1,430	230	805	4·2	4·7	47,900	
July	1,210	560	743	3·9	4·5	45,700	
August	810	300	584	3·1	3·6	35,900	
September	340	155	233	1·2	1·3	13,900	
October	245	118	151	0·8	0·9	9,280	
The period							30

NOTE.—On October 31, river started to freeze over, and the station was abandoned for the season. The river will be clear of ice again about April 1.

Accuracy, "B."

The maximum discharge for 1912 was 1,430 c.f.s. on June 22. The maximum in the famous year of 1894 was probably about 3,000 c.f.s. The maximum of an average year probably would be 2,000 c.f.s. The estimated minimum flow is 50 c.f.s., taking place during the latter part of February and the first dart of March.

CACHE CREEK (220).

Cache creek has its source in the hills northeast of Ashcroft, at an elevation of 5,500 feet and, flowing west, discharges into Bonaparte river 7 miles from its mouth, at an elevation of 1,400 feet. It is part of the Thompson drainage. Its drainage area is about 40 square miles. The water of Cache creek is used entirely for irrigation, and on account of the small run-off and its unreliability there is generally a water shortage in the middle of the summer.

Cache creek lies in the driest portion of the Dry Belt. The precipitation is only from 9 to 12 inches. The summers are very hot and dry, and the winters cold and dry.

Cache creek supplies the irrigation water for the land in the Semlin valley. This valley lies between the Bonaparte and Thompson valleys, connecting the two, and, like the Boston flat on the other side of the Bonaparte, is probably the old bed of a large stream or glacier which at one time flowed down the Bonaparte valley into the Thompson. The Semlin valley is about six miles long and at least half a mile wide. Only part of the land is under cultivation at present on account of the lack of sufficient water for irrigation. But the land is good and, when irrigated, yields good crops. It is this valley that has given the Ashcroft district its reputation for growing good potatoes. Large quantities of alfalfa are grown also for wintering the cattle, which find excellent pasturage in the hills during the summer.

The north branch of Cache creek rises in a wooded country, but the south branch in more open country. Between the two is a hill which rises to an elevation of 5,700 feet. There is a wagon road up the creek as far as the forks, and the fall is only moderate in that part of the creek. Above the forks, however, the stream falls quite rapidly. The road up Cache creek crosses the divide, passes along the head of Eight-mile creek, and comes out to Deadman river above the mouth of Criss creek.

A ditch has been dug to take water from the South branch of Cache creek and carry it to Tsotin lake, on Eight-mile creek. Where Tsotin lake can be filled in this way, it gives quite a supply of water. Eight-mile creek itself is very small. But it is only during the freshet that this diversion can be made, except in very wet years, because the water is needed in the Semlin valley, where the oldest records are held. The Indians claim that there is a lake on the south branch of Cache creek, though its location does not seem to be definitely known. If this, or some other storage site could be utilized to store the flood waters, it would provide more water for the latter part of the irrigation season, when there is usually a shortage. There is also a possibility that there is a feasible route for a flume through the hills from Hihium lake to Cache creek. If such a flume could be built it would provide an abundant water supply for the Semlin valley. But probably the best plan would be to build a flume from the Bonaparte river to supply the Boston flats, and the land at the mouth of Cornwall and Oregon Jack creeks, with a pipe across the Bonaparte to supply the Semlin valley and other adjacent land on that side of the river. But that would take a lot of capital and would require some form of concerted action among the various land owners.

The gauge on Cache creek is 100 feet above the highest diversion, and so measures the whole flow of the stream. It was established on June 9, 1911, and weekly gauge readings were taken during the irrigation seasons of 1911 and 1912 by Mr. C. A. Semlin. The gauge is a five-foot staff, nailed and braced to a small tree stump on the left bank of the creek, 100 feet above the diversion dam. It is referred to three bench-marks. The meter measurements were made by wading at a section 10 feet above the diversion dam. The channel is straight between the gauge and the measuring section and the current is swift. Below the gauging section is a diverting dam which makes the water deeper and quieter. Both banks are high enough to prevent overflow and are covered with bushes. There was a lot of brush in the stream below the site of the gauge, but it was all removed when the gauge was installed.

DISCHARGE MEASUREMENTS of Cache Creek, above diversions, for 1911 and 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911							
June 9	C. G. Cline	1046	8·5	4·9	1·0	0·72	4·9
July 13	"	1046	11·6	5·8	0·2	0·53	1·4
Sept. 25	Cline and Smith	1046	11·0	6·9	0·35	0·58	2·4
Sept. 25	"	1046	12·0	7·5	0·3	0·58	2·4
1912							
May 8	C. G. Cline	1046	15·4	15·4	4·2	1·65	64·6
May 13	"	1046	12·0	15·4	3·2	1·52	49·5
June 13	Cline and Corbould	1046	10·0	4·3	1·5	0·86	6·6
July 13	B. Corbould	1044	8·0	3·4	1·5	0·85	5·2
Aug. 3	"	1044	7·0	2·3	1·1	0·78	2·6
Aug. 29	"	1044	7·0	2·1	1·1	0·77	2·3

DAILY GAUGE HEIGHT AND DISCHARGE of Cache Creek, above diversions, for 1911.

Day.	June.		July.		August.		September.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1		4.7		2.7		2.0		
2		4.7	0.8	2.7		2.5		
3		4.7		2.7		3.0		
4		4.7		2.7		3.5		
5		4.7		2.7		4.0		
6		4.7		2.7		4.3		
7		4.7		2.7	0.7	4.7		
8		4.7		2.7		4.4		
9	0.7	4.7		2.7		4.1		
10		4.7	0.6	2.7		3.8		
11	0.7	4.7		2.4		3.6		
12		4.7		2.1		3.4		
13		4.7		1.8		3.2		
14		4.7		1.5		3.0	0.7	4.7
15		4.7		1.2	0.6	2.7		
16		4.7	0.7	1.0		2.6		
17		4.7		1.0		2.4		
18	0.7	4.7		1.0		2.2		
19		4.3		1.0		2.0		
20		3.9		1.0		1.8		
21		3.5		1.0		1.6		
22		3.1		1.0		1.4		
23	0.6	2.7	0.5	1.0		1.2		
24		2.7		1.0	0.5	1.0	0.7	4.7
25		2.7		1.0		1.2		
26		2.7		1.0		1.5		
27		2.7		1.0		1.8		
28		2.7		1.0		2.1		
29		2.7		1.0		2.4		
30		2.7	0.5	1.0	0.6	2.7		
31		2.0		1.5		2.8		

MONTHLY DISCHARGE of Cache Creek, above diversions, for 1911.

(Drainage area, 35 square miles.)

Month.	Discharge in Second Feet				Run-Off.		Rain-Fall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	4.7	2.7	4.0	0.11	0.12	238	
July	2.7	1.0	1.7	0.05	0.06	105	
August	4.7	1.0	2.7	0.08	0.09	166	
The period							10

NOTE.—The station was maintained only during the irrigation season.
Accuracy "C."

DAILY GAUGE HEIGHT AND DISCHARGE of Cache Creek, above diversions, for 1912.

Day	April Gauge height	April Discharge	May Gauge height	May Discharge	June Gauge height	June Discharge	July Gauge height	July Discharge	August Gauge height	August Discharge	September Gauge height	September Discharge
	Feet.	Sec.-ft	Feet.	Sec. ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft
1		2·7		35		9·0	0·8	3·5				
2	0·6	2·7		40	0·9	7·8		3·5				
3		2·7		45		7·8		3·5				
4		2·7		49		7·8		3·5			0·8	3·5
5		2·7		54		7·8		3·5				
6		2·7	1·6	59		7·8		3·5				
7		2·7		56		7·8		3·5				
8	0·6	2·7		51	0·9	7·8		3·5				
9		2·7		52		7·8		3·5				
10		2·7		50		7·8		3·5				
11		2·7		50		7·8		3·5				
12		2·7	1·5	48		7·8		3·5				
13		2·7		45		7·8		3·5				
14	0·6	2·7		42		7·8	0·8	3·5	0·7	1·0		
15		3·3		39	0·9	7·8		3·5				
16		3·9		36		7·8		3·5				
17		4·5		31		7·0		3·5				
18		5·0		32		6·2		3·5				
19		5·5	1·3	30		5·4		3·5				
20		6·1		28		5·0		3·5				
21	0·8	6·7		26		4·6	0·8	3·5				
22		8·3		21		4·2		3·5				
23		9·9		22	0·8	3·8		3·5				
24		11·5		20		3·5		3·5				
25		13·1		19		3·5		3·5				
26		14·7	1·1	18		3·5		3·5				
27		16·3		16		3·5	0·8	3·5				
28	1·1	18·0		15	0·8	3·5		3·5				
29		22·0		13		3·5		3·5				
30		28·0		12		3·5		3·5				
31				10				3·5				

MONTHLY DISCHARGE of Cache Creek, above diversions, for 1912.

(Drainage area, 35 square miles.)

Month.	Discharge in Second Feet. Maximum	Minimum	Mean	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet.	Rainfall. Inches
April	2·8	2·7	7·1	0·2	0·22	422	
May	5·9	10	34·6	1·0	1·2	2.130	
June	9	3·5	6·1	0·18	0·2	363	
July	3·5	3·5	3·5	0·1	0·11	215	
The period							10

NOTE.—The station was maintained only during the irrigation season.

CAHILTY CREEK [illegible]

Cahilty creek is a tributary of Louis creek, in the North Thompson drainage, and is a torrential mountain stream rising in the highest hills of the district at 7,000 feet, and dropping 5,000 feet [illegible] Louis creek. The snow remains on mount Todd at the head [illegible] many years. The precipitation at the source is mostly in the form of snow [illegible] during the late spring. At the mouth of Cahilty creek [illegible] average year is about 20 inches. The water of Cahilty creek [illegible] for irrigation purposes, and there are excellent waterpower [illegible] development has as yet been made.

Cahilty lakes [illegible] excellent storage for the spring freshet. A narrow [illegible] creek flows at the outlet of the lake could easily be dammed [illegible] second-feet [illegible]

The [illegible] British Columbia [illegible]

The station on Cahilty creek [illegible] August 17, 1911, by C. G. Cline, and weekly readings were [illegible] October, 1911, and also from April 1 to October 31, 1912. It is located [illegible] creek's mouth. The gauge is a standard vertical staff gauge [illegible] 10-inch cottonwood on the left bank of the stream. M[illegible] about 175 feet below the gauge.

The [illegible] are high and rocky, while the bed is rough. [illegible] its waters join Louis creek [illegible]

The [illegible] the right bank of Cahilty creek, whose [illegible] referred [illegible]

DISCHARGE MEASUREMENTS of Cahilty Creek at mouth, for 1911.

Date	Hydrographer	Meter No.	Width.	Area of section	Mean velocity	Gauge height	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911							
Aug. 17	C. G. Cline	1046	12.0	6.7	0.7	0.93	5.0
Sept. 16	"	1046	[illegible]	12.4	1.2	1.27	14.8
1912							
April 30	C. G. Cline and E. M. Dann	1046	14.0	8.3	0.9	1.10	7.5
May 16	E. M. Dann	1046	21.0	37.7	4.8	2.20	183
Aug. 22	H. J. E. Keys	1057	16.0	12.2	1.3	1.30	16.0

Daily Gauge Height and Discharge of Cahilty Creek, at mouth, for 1911.

Day.	August.		September.		October.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·0	2·0		6·9
2				2·0	1·1	7·0
3			0·8	2·0		6·3
4				2·2		5·7
5				2·5		5·2
6				2·7		4·7
7				3·0	0·95	4·2
8				3·2		4·3
9			0·9	3·5		4·4
10				5·1		4·5
11				6·7		4·6
12				8·3		4·7
13				9·9		4·8
14				11·5		4·9
15				13·0	1·0	5·0
16			1·27	14·5		4·5
17			1·2	11·0		4·0
18	0·9	3·5		10·2		3·6
19				9·5		3·2
20				8·8		2·8
21				8·1		2·4
22				7·4	0·8	2·0
23				6·7		2·0
24			1·05	6·0		2·0
25				6·1		2·0
26				6·2		2·0
27				6·3		2·0
28	0·8	2·0		6·4		2·0
29				6·5	0·8	2·0
30				6·7		2·0
31						2·0

MONTHLY DISCHARGE of Cahilty Creek, at mouth, for 1911.

(Drainage area, 20 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
August	3·5	2·0					
September	14·5	2·0	6·6	·33	·37	393	
October	7·0	2·0	3·8	·19	·22	234	
The period							20

NOTE.—Station established on Cahilty creek August 17, 1911.
Accuracy, "A."

Daily Gauge Height and Discharge

Day.	April. Gauge height.	April. Discharge.	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		2·0		9·1		164
2		2·0		11·7		145
3		2·0		14·1	2·0	125
4		2·0		16·5		110
5		2·0	1·35	19·0		154
6		2·0		30·6		169
7		2·0		42·2		183
8		2·0		53·8		198
9		2·0		65·4	2·3	212
10	0·8	2·0		77·0		222
11		2·0		88·5		231
12		2·1	1·9	100·0		241
13		2·2		120·5		251
14		2·3		141·0		260
15		2·3		161·5		270
16		2·4	2·2	182·0	2·5	280
17		2·4		182·0		258
18		2·5		182·0		236
19		2·6	2·2	182·0		214
20		2·7		196·0		192
21	0·85	2·7		210·0		170
22		2·8		224·0		148
23		2·9		238·0	2·0	125
24		3·0		252·0		115
25		3·1		266·0		106
26		3·2	2·5	280·0		96
27		3·3		261·0		87
28		3·4		241·0		77
29	0·90	3·5		222·0		68
30	1·10	7·0		202·0	1·7	58
31				183·0		

...of Cahilty Creek, at mouth, for 1912.

July		August		September		October		Day
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	
1.[illegible]	[illegible]		14	1.5	[illegible]		[illegible]	1
	65		[illegible]		[illegible]		[illegible]	2
	72		12		4		[illegible]	3
	79	1.2	[illegible]		[illegible]		10	4
	85		14		[illegible]		10	5
	[illegible]		[illegible]		44	1.2	11	6
1.[illegible]	100		[illegible]		42		10	7
	92		[illegible]	1.[illegible]	[illegible]		10	8
	84		[illegible]		40		9	9
	76		[illegible]		[illegible]		[illegible]	10
	68	1.[illegible]	[illegible]		[illegible]		[illegible]	11
	60		[illegible]		[illegible]		[illegible]	12
	52		[illegible]		[illegible]	1.1	[illegible]	13
1.[illegible]	[illegible]		[illegible]		[illegible]		[illegible]	14
	[illegible]		[illegible]	1.4	22		[illegible]	15
	[illegible]		[illegible]		20		9	16
	[illegible]		[illegible]		18		[illegible]	17
	25	1.4	[illegible]		17		10	18
	20		[illegible]		16		10	19
1.[illegible]	[illegible]		20		14	1.2	11	20
	[illegible]		[illegible]		12		11	21
	17	1.[illegible]	[illegible]	1.2	11		10	22
	18		[illegible]		11		9	23
	19		[illegible]		10		8	24
	20	1.[illegible]	[illegible]		10		[illegible]	25
	20		[illegible]		9		6	26
	21		20		9	1.0	5	27
1.4	22		22		8		5	28
	20		24	1.1	[illegible]		5	29
	18		[illegible]		[illegible]		[illegible]	30
	[illegible]		[illegible]				5	31

MONTHLY DISCHARGE of Cahilty Creek, at mouth, for 1912.

(Drainage area, 20 square miles.)

Month.	Discharge in Second-Feet				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area	Total in acre-feet	Inches
April	7.0	2.0	2.6	.13	.15	155	
May	280	9.4	144	7.20	8.30	8,854	
June	280	58	173	8.65	9.65	10,294	
July	100	16	45	2.25	2.59	2,767	
August	31	11	21	1.05	1.21	1,291	
September	43	7	23	1.15	1.28	1,368	
October	11	5	8.4	.42	.48	516	
The period							25

NOTE.—Accuracy "A" and "B".

CAMPBELL CREEK (250 AND 251).

The right branch of Campbell creek rises in the Campbell meadows at an elevation of 3,000 feet and the left branch in Napier lake at an elevation of 2,200 feet; the stream discharges into the South Thompson at an elevation of 1,110 feet. Campbell creek is in the eastern portion of the Dry Belt, the annual precipitation at the mouth being from 8 inches to 10 inches, and at the head-waters from 12 inches to 15 inches. Campbell creek is a very conti ous irrigation stream. The Hydrographic Survey has two stations on it—one at Todd's Corners and the other at the Campbell estate at the mouth—the latter for the purpose of making a study of seepage loss. A slight decrease in discharge is found between the two stations, a portion of the flow of Campbell creek joining Thompson river as underground water.

The upper reaches of the creek are well timbered with British Columbia fir, jack pine and spruce, and there are large lakes at the head of Campbell creek proper. These lakes are Trapp, Shumway and Napier. Their superficial area is large, and evaporation in this dry country is great. In the season of 1911 the run-off from these lakes was nil, all Campbell creek water coming down Scuittoe creek (the right branch of Campbell creek) from the Campbell meadows. The lakes are unreliable for storage purposes.

The Campbell estate holds the prior records on this stream and controls practically the whole flow of Campbell creek.

The Campbell estate has constructed a small dam on Campbell meadows, where water is stored and is used in the late summer for irrigation.

At the height of the irrigation season (June 7) the two diversions above the station at Todd's Corners were carrying 4.5 second-feet; at no time did they exceed this amount, which is about their mean flow for the irrigation season.

The daily flow of Campbell creek, especially in the late summer, is not the true normal discharge of the stream, but depends upon the artificial control of the storage reservoir.

The station at Todd's Corners (250) was established on May 27, 1911, by C. E. Richardson, and daily gauge readings were taken during the i gation seasons of

1911 and 1912. It is located [illegible] Prov[illegible] road.

[illegible] flow are made from the bridge [illegible] The [illegible]

[illegible] Measurements [illegible]

Discharge Measurements of [illegible] 1911[illegible]

Date	Hydrographer	Meter No.	Width	Area of section	Mean velocity	Gauge height	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
1911							
May 27	W. M. Car[illegible]	1044	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
May 27	C. E. R. [illegible]	[illegible]	14.0	21.[illegible]	[illegible]	[illegible]	[illegible]
May 27	C. G. C[illegible]	[illegible]	12.0	[illegible]	2.5	[illegible]	[illegible]
June [illegible]	C. E. R[illegible]	[illegible]	[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
June 23	W. M. C[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.47	11.7
July [illegible]		1044	[illegible]	[illegible]	[illegible]	1.16	6.4
July 28		1044	4.5	1.[illegible]	[illegible]	0.[illegible]	2.1
Aug. 17		[illegible]44	4.0	[illegible]	[illegible]	0.75	[illegible]
1912							
May 26	E. M. D[illegible]	1044	[illegible]	[illegible]	[illegible]	2.[illegible]	47.0
July 18	H. [illegible] E. K[illegible]	1057	7.5	2.[illegible]	[illegible]	0.81	[illegible]
July 23		268	[illegible]	1.3	1.5	0.66	2.0

DAILY GAUGE HEIGHT AND DISCHARGE of Campbell Creek, at Todd's Corners, for 1911.

Day	May Gauge height	May Discharge	June Gauge height	June Discharge	July Gauge height	July Discharge	August Gauge height	August Discharge	September Gauge height	September Discharge	October Gauge height	October Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.78	20.0	1.10	4.7	0.8	1.6	0.65	1.0	0.6	0.8
2			1.79	20.3	1.08	4.4	0.85	1.9	0.65	1.0	0.6	0.8
3			1.78	20.0	1.05	4.0	0.85	1.9	0.65	1.0	0.6	0.8
4			1.84	21.9	1.05	4.0	0.8	1.6	0.62	0.9	0.6	0.8
5			1.81	20.9	1.05	4.0	0.8	1.6	0.62	0.9		
6			1.82	21.2	1.05	4.0	0.84	1.9	0.60	0.8		
7			1.86	22.5	1.06	4.1	0.91	2.4	0.61	0.8		
8			1.85	22.2	1.10	4.7	0.92	2.5	0.60	0.8		
9			1.86	22.5	1.15	5.4	0.85	1.9	0.62	0.9		
10			1.85	22.2	1.19	6.2	0.82	1.7	0.62	0.9		
11			1.80	20.6	1.15	5.4	0.82	1.7	0.60	0.8		
12			1.75	19.2	1.20	6.4	0.80	1.6	0.60	0.8		
13			1.70	17.8	1.12	5.0	0.80	1.6	0.61	0.8		
14			1.66	16.8	1.09	4.5	0.80	1.6	0.62	0.9		
15			1.59	15.1	1.06	4.1	0.75	1.3	0.62	0.9		
16			1.55	14.1	1.02	3.6	0.75	1.3	0.61	0.9		
17			1.52	13.4	0.98	3.1	0.74	1.3	0.62	0.9		
18			1.48	12.4	0.94	2.7	0.73	1.2	0.62	0.9		
19			1.45	11.8	0.90	2.3	0.73	1.2	9.6	0.8		
20			1.42	11.1	0.90	2.3	0.72	1.2	0.60	0.8		
21			1.44	11.5	0.90	2.3	0.7	1.1	0.60	0.8		
22			1.50	12.9	0.90	2.3	0.7	1.1	0.65	1.0		
23			1.41	10.8	0.90	2.3	0.73	1.2	0.62	0.9		
24			1.39	10.4	0.88	2.2	0.72	1.2	0.6	0.8		
25			1.35	9.4	0.86	2.0	0.72	1.2	0.6	0.8		
26			1.26	7.5	0.89	2.2	0.70	1.1	0.6	0.8		
27	1.83	21.6	1.24	7.2	0.87	2.1	0.70	1.1	0.6	0.8		
28	1.80	20.6	1.20	6.4	0.85	1.9	0.70	1.1	0.6	0.8		
29	1.82	21.2	1.21	6.6	0.85	1.9	0.67	1.0	0.6	0.8		
30	1.80	20.6	1.18	6.1	0.84	1.9	0.67	1.0	0.58	0.7		
31	1.79	20.3			0.80	1.6	0.67	1.0				

MONTHLY DISCHARGE of Campbell Creek, at Todd's Corners, for 1911.

(Drainage area, 200 square miles.)

Month.	Discharge in Second-Feet. Maximum	Minimum	Mean	Run-Off. Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Rainfall. Inches
June	22.5	6.1	15.2	·07	·08	905	
July	6.4	1.6	3.5	·02	·02	215	
August	2.5	1.0	1.5	·10	·01	95	
September	1.0	0.7	0.85	·004	·004	51	
The period							9

NOTE.—This station was not established till after the spring freshet of 1911. To the total run-off in acre-feet should be added 600 acre-feet, which quantity of water was diverted and used for irrigation by two small irrigation ditches whose headgates are situate above the gauging station, and whose flow was measured from time to time.

Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Campbell Creek, at Todd's Corners, for 1912.

Day	April		May		June		July		August		September	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1		2·6	0·76	1·4	2·03	32·2	1·49	15·1	0·68	2·3	0·86	3·6
2	0·93	2·6	0·76	1·4	1·9[illegible]	28·9	1·36	12·1	0·68	2·3	0·83	3·1
3	0·9	2·3	0·76	1·4	1·79	23·7	1·36	12·1	0·66	2·7	0·81	3·2
4	0·86	2·0	0·78	1·5	1·66	19·7	1·34	11·6	0·66	2·2	0·80	3·2
5	0·8	1·6	0·73	1·2	1·63	18·8	1·31	10·9	0·88	3·8	0·78	3·0
6	0·78	1·5	0·76	1·4	1·61	18·3	1·29	10·5	0·93	4·4	0·78	3·0
7	0·77	1·4	0·88	2·2	1·58	17·5	1·24	9·5	0·91	4·1	0·76	2·9
8	0·76	1·4	0·93	2·6	1·51	16·4	1·21	8·9	0·88	3·8	0·76	2·9
9	0·76	1·4	0·98	3·1	1·46	14·4	1·21	8·9	0·88	3·8	0·76	2·9
10	0·76	1·4	1·03	3·7	1·41	13·2	1·19	8·5	0·86	3·6	0·76	2·9
11	0·76	1·4	1·68	17·3	1·41	13·2	1·11	7·2	0·81	3·4	0·73	2·7
12	0·76	1·4	1·83	21·6	1·41	13·2	1·11	7·2	0·81	3·2	0·73	2·7
13	0·73	1·2	2·06	29·9	1·43	13·7	1·09	6·8	0·78	3·0	0·73	2·7
14	0·73	1·2	2·26	39·8	1·49	15·1	1·08	6·7	0·78	3·0	0·71	2·6
15	0·73	1·2	2·11	31·9	1·51	15·6	1·06	6·3	0·76	2·9	0·71	2·6
16	0·73	1·2	2·17	35·0	1·51	15·6	1·04	6·0	0·76	2·9	0·66	2·2
17	0·73	1·2	2·23	38·1	1·51	15·6	0·97	4·9	0·76	2·9		
18	0·73	1·2	2·26	39·8	1·49	15·1	0·81	3·5	0·76	2·9		
19	0·72	1·2	2·36	45·6	1·49	15·1	0·71	2·6	0·81	3·2		
20	0·71	1·1	2·36	45·6	1·46	14·4	0·63	2·1	0·88	3·8		
21	0·71	1·1	2·27	40·3	1·41	13·2	0·61	2·0	0·96	4·8		
22	0·71	1·1	2·31	42·6	1·39	12·8	0·61	2·0	0·91	4·1		
23	0·71	1·1	2·31	42·6	1·36	12·1	0·68	2·3	0·88	3·8		
24	0·76	1·4	2·31	42·6	1·36	12·1	0·83	3·4	0·86	3·6		
25	0·71	1·1	2·36	45·6	1·23	9·3	0·91	4·1	0·86	3·6		
26	0·71	1·1	2·38	46·8	1·11	7·2	0·86	3·6	0·81	3·2		
27	0·71	1·1	2·39	47·5	1·71	21·1	0·81	3·2	0·83	3·4		
28	0·76	1·4	2·41	48·5	1·63	18·8	0·76	2·9	0·86	3·6		
29	0·76	1·4	2·41	48·5	1·46	14·4	0·76	2·9	0·87	3·7		
30	0·76	1·4	2·39	47·5	1·41	13·2	0·73	2·7	0·91	4·1		
31			2·29	42·6			0·71	2·6	0·86	3·6		

MONTHLY DISCHARGE of Campbell Creek, at Todd's Corners, for 1912.

(Drainage area, 200 square miles.)

Month.	Discharge in Second Feet.				Run Off		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	2·6	1·1	1·4	·005	·006	84	
May	48·5	1·2	27·7	·13	·15	1,703	
June	32·2	7·2	16·1	·08	·09	958	
July	15·1	2·0	6·2	·03	·03	381	
August	4·8	2·2	3·4	·017	·019	209	
The period							11

NOTE.—To the total run-off in acre-feet should be added 600 acre-feet, whic[illegible]ntity was diverted during the irrigation season through two small ditches, whose headgates are situate above the gauging station, and whose flow was measured from time to time.

Accuracy, "A."

DISCHARGE MEASUREMENTS of Campbell Creek, above Campbell Estate diversion, for 1911 and 1912.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet	Sec.-ft.
1911.							
June 7	C. E. Richardson	1048	17·0	8·5	1·8	[illegible]	[illegible]
June 23	W. M. Carlyle	1044	12·0	7·4	1·5	1·48	19·8
July 28	"	1044	4·8	1·8	0·7	1·11	1·3
Aug. 17	"	1044	5·0	1·7	0·5	1·06	0·9
1912.							
May 23	E. M. Dann	1014	15·0	11·5	2·0	1·85	29·4
May 26	"	1014	14·5	11·4	2·5	1·90	36·2
July 23	H. J. E. Keys	1057	2·5	0·6	4·3	1·20	2·7

DAILY GAUGE HEIGHT AND DISCHARGE of Campbell Creek, above Campbell Estate diversion, for 1911.

Day.	May.		June.		July.		August.		September.	
	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·7	19·2	1·35	6·2	1·1	1·2	1·0	0·3
2			1·7	19·2	1·3	4·8	1·1	1·2	1·0	0·3
3			1·7	19·2	1·3	4·8	1·1	1·2	1·0	0·3
4			1·7	19·2	1·3	4·8	1·1	1·2	1·0	0·3
5			1·8	25·7	1·3	4·8	1·1	1·2	1·0	0·3
6			1·7	19·2	1·25	3·7	1·1	1·2	1·0	0·3
7			1·7	19·2	1·3	4·8	1·1	1·2	1·0	0·3
8			1·6	15·0	1·3	4·8	1·15	1·9	1·0	0·3
9			1·65	17·2	1·3	4·8	1·15	1·9	1·0	0·3
10			1·7	19·2	1·3	4·8	1·1	1·2	1·0	0·3
11			1·6	15·0	1·3	4·8	1·1	1·2	1·0	0·3
12			1·65	17·1	1·3	4·8	1·1	1·2	1·0	0·3
13			1·6	15·0	1·3	4·8	1·1	1·2	1·0	0·3
14			1·5	11·1	1·3	4·8	1·1	1·2	1·0	0·3
15			1·55	13·0	1·25	3·7	1·05	0·7	1·0	0·3
16			1·5	11·1	1·25	3·7	1·05	0·7	1·0	0·3
17			1·5	11·1	1·2	2·7	1·05	0·7	0·95	0·1
18			1·5	11·1	1·2	2·7	1·05	0·7	0·95	0·1
19			1·5	11·1	1·2	2·7	1·0	0·3	0·9	creek dry
20			1·5	11·1	1·2	2·7	1·0	0·3	0·9	
21			1·5	11·1	1·2	2·7	1·0	0·3	0·9	
22			1·5	11·1	1·15	1·9	1·0	0·3	0·9	
23			1·48	10·5	1·1	1·2	1·0	0·3	0·9	
24			1·45	9·4	1·1	1·2	1·0	0·3	0·9	
25	1·3	4·8	1·3	4·8	1·1	1·2	1·0	0·3	0·9	
26	1·5	11·1	1·3	4·8	1·1	1·2	1·0	0·3	0·9	
27	1·62	15·8	1·2	2·7	1·1	1·2	1·0	0·3	0·9	
28	1·6[illegible]	17·1	1·[illegible]	4·8	1·1	1·2	1·0	0·3	0·9	
29	1[illegible]	15·0	1·3	4·8	1·1	1·2	1·0	0·3	0·9	
30	1[illegible]	17·1	1·3	4·8	1·1	1·2	1·0	0·3	0·9	
31	1[illegible]	19·2			1·1	1·2	1·0	0·3		

MONTHLY DISCHARGE of Campbell Creek, above Campbell Estate diversion, for 1911.
(Drainage area, 200 square miles.)

Month	Discharge in Second-Feet.				Run Off		Rainfall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	19·2	0	3·2	·02	·02	197	
June	25·7	2·7	12·9	·06	·07	768	
July	6·2	1·2	3·3	·02	·02	203	
August	1·9	0·3	0·8	·004	·005	49	
September	·3	0	0·2	·001	·001	12	
The period							9

NOTE.—Creek commenced to run at the Campbell Estate on May 25. It ran dry on September 19. Accuracy, "A."

GAUGE HEIGHT AND DAILY DISCHARGE of Campbell Creek, above Campbell Estate diversion, for 1912.

Day.	May.		June.		July.		August.		September.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge Height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·9	34·8	1·6	15·0	1·1	1·2	1·1	1·2
2			1·7	19·2	1·5	11·1		1·2	.....	1·2
3			1·6	15·0	1·5	11·1	1·1	1·2	1·1	1·2
4			1·6	15·0	1·5	11·1		1·2		1·2
5			1·6	15·0	1·5	11·1	1·1	1·2	1·1	1·2
6			1·6	15·0	1·5	11·1		1·2		1·2
7		creek	1·6	15·0	1·4	7·7	1·1	1·2	1·1	1·2
8		dry	1·6	15·0	1·4	7·7	....	1·2	....	1·2
9			1·6	15·0	1·3	4·8	1·1	1·2	1·0	0·3
10	1·2	2·7	1·6	15·0	1·3	4·8	1·1	1·2		0·3
11	1·4	7·7	1·6	15·0	1·3	4·8	1·1	1·2	[illegible]	0·3
12	1·65	17·1	1·6	15·0	1·3	4·8		1·2		0·3
13	1·7	19·2	1·6	15·9	1·3	4·8	1·1	1·2	1·0	0·3
14	1·8	25·7	1·6	15·0	1·3	4·8		1·2	1·0	9·3
15	1·8	25·7	1·6	15·0		3·7	1·1	1·2		
16	1·8	25·7	1·6	15·0	1·2	2·7		1·2		creek
17	1·9	31·8	1·6	15·0		2·7	1·1	1·2		dry
18	2·0	45·0	1·6	15·0	1·2	2·7	1·1	1·2		
19	1·8	25·7	1·6	15·0		2·7	1·1	1·2		
20	1·9	34·8	1·6	15·0	1·2	2·7	1·1	1·2		
21	1·9	34·8	1·6	15·0	1·2	2·7		1·2		
22	1·9	34·8	1·6	15·0	1·2	2·7	1·1	1·2		
23	1·9	34·8	1·6	15·0		2·7		1·2		
24	1·9	34·8	1·6	15·0	1·2	2·7	1·1	1·2		
25	1·9	34·8	1·6	15·0		2·7		1·2		
26	1·9	34·8	1·6	15·0	1·2	2·7	1·1	1·2		
27	1·9	34·8	1·9	31·8		2·0		1·2		
28	1·9	34·8	1·8	25·7	1·1	1·2	1·1	1·2		
29	1·9	34·8	1·7	19·2		1·2		1·2		
30	1·9	34·8	1·6	15·0	1·1	1·2	1·1	1·2		
31	1·9	34·8				1·2	1·1	1·2		

MONTHLY DISCHARGE of Campbell Creek, Campbell Estate diversion, for 1912.
(Drainage area, 200 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area	Total in acre-feet.	Inches
May	45·0	0	20·7	·10	·11	1,273	
June	34·8	15·0	16·9	·08	·09	1,006	
July	15·0	1·2	5·0	·02	·02	307	
August	1·2	1·2	1·2	·005	·006	74	
September	1·2	0	0·3	·001	·001	18	
The period							11

NOTE.—Creek commenced to run at the Campbell Estate on May 10. It ran dry on Sept. 14.
Accuracy, "A."

CANOE CREEK (310).

Canoe creek is a small stream, 8 miles long, rising in the hills 4 miles east of Salmon Arm, at an elevation of 1,500 feet, and discharging into Salmon Arm of Shuswap lake at Canoe station at an elevation of 1,150 feet, about 5 miles east of Salmon Arm. Its drainage area is 30 square miles, and the mean annual precipitation from 15 inches to 25 inches. It is a stream from 5 feet to 10 feet wide and from 6 inches to 1½ feet deep. It flows with an average velocity of 1½ miles an hour.

The East Fork, which rises in the Larch hills (elevation 3,000 feet) is 5 miles long and empties into Canoe creek about 3 miles from the mouth. This stream carries about 35 per cent of the water of Canoe creek, and it is from this that the municipality of Salmon Arm is obtaining (system now under construction) its water supply. Analysis shows that the water is ideal for drinking.

About one mile from its mouth, the East Fork disappears completely and comes to the surface again about half a mile from its mouth.

The maximum discharge of Canoe creek in 1912 was 35 second-feet, and took place on May 8. In January the discharge was as low as 2 second-feet. The yearly mean is about 6.5 second-feet.

The station was established by C. E. Richardson on June 2, 1911, and continuous readings were taken up to September, 1912. The measuring section is on the upstream side of the bridge on a blind road, one-half mile north of the main trunk road from Salmon Arm to Enderby. The gauge is a standard vertical staff gauge 5 feet long, and is located at the right end of the bridge, on the upstream side. Measurements are made from the bridge with wading equipment.

The banks of the creek are high and wooded, with no danger of overflow. The bed of the stream is of gravel, and the creek is confined to one channel. There are three bench-marks referred to the gauge datum.

DISCHARGE MEASUREMENTS of Canoe Creek, near Salmon Arm, for 1911 and 1912

Date	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911							
June 3	G. H. Richardson	1348	7.[illegible]	[illegible].2	1.4	2.0	14.6
June 12	"	1048	7.5	6.2	1.3	1.76	8.1
June 26	"	1048	7.5	7.5	0.[illegible]	1.48	4.[illegible]
Aug. 1	"	1048	7.5	[illegible].7	0.7	1.3[illegible]	3.2
1912							
May 19	H. C. Hughes	1048	8.[illegible]	14	1.4	2.55	20.8
June 14	C. E. Richardson	1048	6.0	[illegible]	1.3	1.66	5.7
Sept. 6	"	1047	7.0	[illegible]	1.0	1.5	3.6

* Different section.

DAILY GAUGE HEIGHT AND DISCHARGE of Canoe Creek, near Salmon Arm, 1911.

Day.	June. Gauge height.	June. Discharge	July. Gauge height.	July. Discharge	August. Gauge height.	August. Discharge	September. Gauge height.	September. Discharge	October. Gauge height.	October. Discharge	November. Gauge height.	November. Discharge	December. Gauge height.	December. Discharge	Day
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
1		13·0	1·55	4·9	1·40	3·3	1·42	3·5	1·60	5·5	1·60	5·5	1·58	5·2	1
2		13·0	1·52	4·6	1·40	3·3	1·42	3·5	1·60	5·5	1·60	5·5	1·58	5·2	2
3		13·0	1·50	4·2	1·40	3·3	1·42	3·5	1·60	5·5	1·62	5·9	1·58	5·2	3
4	1·95	13·0	1·45	3·7	1·40	3·3	1·50	4·2	1·60	5·5	1·65	6·2	1·58	5·2	4
5	1·90	11·5	1·45	3·7	1·40	3·3	1·50	4·2	1·60	5·5	1·70	7·1	1·58	5·2	5
6	1·90	11·5	1·42	3·5	1·42	3·5	1·50	4·2	1·60	5·5	1·68	6·6	1·58	5·2	6
7	1·88	10·8	1·42	3·5	1·55	4·8	1·50	4·2	1·60	5·5	1·70	7·1	1·58	5·2	7
8	1·85	10·1	1·72	7·5	1·45	3·7	1·50	4·2	1·60	5·5	1·70	7·1	1·58	5·2	8
9	1·80	9·0	1·72	7·5	1·42	3·5	1·50	4·2	1·62	5·9	1·62	5·9	1·55	4·8	9
10	1·80	9·0	1·68	6·6	1·42	3·5	1·50	4·2	1·62	5·9	1·62	5·9	1·55	4·8	10
11	1·80	9·0	1·68	6·6	1·42	3·5	1·50	4·2	1·65	6·2	1·65	6·2	1·52	4·5	11
12	1·78	8·4	1·55	4·8	1·42	3·5	1·50	4·2	1·68	6·6	1·65	6·2	1·52	4·5	12
13	1·72	7·4	1·52	4·5	1·42	3·5	1·60	5·5	1·68	6·6	1·62	5·9	1·52	3·5	13
14	1·70	7·1	1·50	4·2	1·42	3·5	1·60	5·5	1·70	7·1	1·60	5·5	1·52	4·5	14
15	1·65	6·2	1·45	3·7	1·42	3·5	1·60	5·5	1·70	7·1	1·60	5·5	1·52	4·5	15
16	1·58	5·2	1·45	3·7	1·42	3·5	1·60	5·5	1·70	7·1	1·60	5·5	1·52	4·5	16
17	1·55	4·8	1·45	3·7	1·42	3·5	1·60	5·5	1·68	6·6	1·60	5·5	1·52	4·5	17
18	1·52	4·5	1·42	3·5	1·40	3·3	1·60	5·5	1·68	6·6	1·60	5·5	1·52	4·5	18
19	1·50	4·2	1·42	3·5	1·40	3·3	1·60	5·5	1·65	6·2	1·62	5·9	1·52	4·5	19
20	1·50	4·2	1·42	3·5	1·48	4·0	1·60	5·5	1·65	6·2	1·60	5·5	1·52	4·5	20
21	1·45	3·7	1·42	3·5	1·42	3·5	1·60	5·5	1·65	6·2	1·60	5·5	1·52	4·5	21
22	1·60	5·5	1·42	3·5	1·42	3·5	1·60	5·5	1·62	5·9	1·60	5·5	1·52	4·5	22
23	1·50	4·2	1·42	3·5	1·42	3·5	1·60	5·5	1·62	5·9	1·60	5·5	1·52	4·5	23
24	1·50	4·2	1·40	3·3	1·42	3·5	1·60	5·5	1·62	5·9	1·60	5·5	1·52	4·5	24
25	1·50	4·2	1·40	3·3	1·42	3·5	1·60	5·5	1·62	5·9	1·62	5·9	1·50	4·2	25
26	1·45	3·7	1·40	3·3	1·42	3·5	1·60	5·5	1·62	5·9	1·60	5·5	1·50	4·2	26
27	1·60	5·5	1·40	3·3	1·42	3·5	1·60	5·5	1·62	5·9	1·60	5·5	1·50	4·2	27
28	1·55	4·8	1·40	3·3	1·42	3·5	1·60	5·5	1·62	5·9	1·60	5·5	1·50	4·2	28
29	1·50	4·2	1·40	3·3	1·42	3·5	1·60	5·5	1·60	5·5	1·60	5·5	1·50	4·2	29
30	1·45	3·7	1·40	3·3	1·42	3·5	1·60	5·5	1·60	5·5	1·60	5·5	1·47	4·0	30
31			1·40	3·3	1·42	3·5			1·60	5·5			1·47	4·0	31

Monthly Discharge of Canoe Creek, near Salmon Arm, for 1911.

Month.	Discharge in Second Feet.				Run-Off.		Rainfall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	13.0	[illegible]	7.[illegible]	24	27	[illegible]	
July	7.5	[illegible]	4.1	14	16	252	
August	4.8	[illegible]	3.5	11	13	215	
September	5.5	[illegible]	4.6	16	18	[illegible]	
October	7.1	5.5	[illegible]	20	23	[illegible]	
November	7.1	5.5	5.8	19	21	[illegible]45	
December	7.2	4.0	4.6	15	17	283	
The period							14

Note.—Ice conditions probably existed for very short periods during November and December. Since the figures given are for a discharge curve applicable only to conditions of open flow, the discharges given for these months may be slightly too large.

November and December, accuracy "C"; the other months "B."

DAILY GAUGE HEIGHT AND DISCHARGE

Day	January.		February.		March.		April.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·45	3·2	1·38	2·6	1·5	3·7	1·6	4·8
2	1·48	3·5	1·38	2·6	1·5	3·7	1·65	5·4
3	1·50	3·7	1·38	2·6	1·5	3·7	1·7	6·0
4	1·55	4·2	1·35	2·4	1·5	3·7	1·75	6·7
5	1·53	4·0	1·35	2·4	1·48	3·5	1·78	7·1
6	1·50	3·7	1·33	2·3	1·48	3·5	1·78	7·1
7	1·45	3·2	1·38	2·6	1·45	3·2	1·8	7·4
8	1·40	2·8	1·43	3·0	1·45	3·2	1·85	8·2
9	1·40	2·8	1·45	3·2	1·43	3·0	1·9	8·9
10	1·40	2·8	1·45	3·2	1·43	3·0	2·0	10·5
11	1·38	2·6	1·45	3·2	1·4	2·8	2·1	12·3
12	1·28	2·6	1·45	3·2	1·4	2·8	2·2	14·1
13	1·35	2·4	1·48	3·5	1·4	2·8	2·3	16·0
14	1·35	2·4	1·48	3·5	1·4	2·8	2·38	17·6
15	1·33	2·3	1·5	3·7	1·4	2·8	2·38	17·6
16	1·33	2·3	1·5	3·7	1·4	2·8	2·38	17·6
17	1·33	2·3	1·53	4·0	1·4	2·8	2·38	17·6
18	1·30	2·1	1·55	4·2	1·4	2·8	2·4	18·0
19	1·30	2·1	1·55	4·2	1·4	2·8	2·4	18·0
20	1·30	2·1	1·53	4·0	1·4	2·8	2·4	18·0
21	1·30	2·1	1·53	4·0	1·4	2·8	2·4	18·0
22	1·30	2·1	1·53	4·0	1·4	2·8	2·4	18·0
23	1·33	2·3	1·5	3·7	1·4	2·8	2·43	18·6
24	1·33	2·3	1·5	3·7	1·4	2·8	2·6	22·0
25	1·35	2·4	1·5	3·7	1·45	3·2	2·6	22·0
26	1·38	2·6	1·5	3·7	1·50	3·7	2·6	22·0
27	1·38	2·6	1·5	3·7	1·55	4·2	2·6	22·0
28	1·4	2·8	1·5	3·7	1·6	4·8	2·6	22·0
29	1·4	2·8			1·6	4·8	2·7	24·0
30	1·4	2·8			1·58	4·5	2·8	26·0
31	1·4	2·8			1·58	4·5		

of Canoe Creek, near Salmon Arm, 1912

May		June		July		August		September		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
2·8	26·0	1·85	[illegible]	1·4	2·8		2·5		4·3	1
2·8	26·0	1·75	[illegible]	1·4	2·8	1·35	2·4	1·58	4·5	2
2·8	26·0	1·75	[illegible]	1·4	2·8		2·4		5·0	3
2·8	26·0	1·75	[illegible]	1·42	3·0		2·4	1·65	5·4	4
2·9	28·0	1·75	[illegible]	1·45	[illegible]	[illegible]	2·4		6·0	5
3·0	30·1	1·65	5·4	1·5	[illegible]		2·4	1·75	6·7	6
3·1	32·2	1·6	4·8	1·48	[illegible]	[illegible]	2·4	Gauge readings		7
3·2	34·4	1·6	4·8	1·45	[illegible]		2·4	discontinued.		8
3·1	32·2	1·55	4·2	1·45	[illegible]	[illegible]	2·4			9
3·0	30·1	1·5	[illegible]	1·45	[illegible]		2·5			10
2·9	28·0	1·55	4·2	1·42	[illegible]		2·5			11
2·8	26·0	1·55	4·2	1·42	3·0	1·38	2·6			12
2·8	26·0	1·6	4·8	1·4	2·8		2·7			13
2·8	26·0	1·65	5·4	1·4	2·8	1·4	2·8			14
2·8	26·0	1·65	5·4	1·4	2·8		3·0			15
2·7	24·0	1·65	5·4		2·8	1·45	3·2			16
2·7	24·0	1·6	4·8	1·4	3·0		3·2			17
2·6	22·0	1·6	4·8		3·0		3·2			18
2·6	22·0	1·55	4·2	1·45	3·2	1·45	3·2			19
2·55	21·0	1·5	[illegible]		3·4		3·0			20
2·5	20·0	1·45	3·2		3·5	1·4	2·8			21
2·45	19·0	1·4	2·8	1·5	3·7		2·8			22
2·4	18·0	1·4	2·8		3·7	1·4	2·8			23
2·3	16·0	1·4	2·8	1·5	3·7		2·9			24
2·2	14·1	1·4	2·8		3·5		3·1			25
2·2	14·1	1·4	2·8	1·45	3·2	1·45	3·2			26
2·1	12·3	1·4	2·8		3·1		3·4			27
2·0	10·5	1·4	2·8		2·9	1·5	3·7			28
1·9	8·9	1·4	2·8	1·4	2·8		3·9			29
1·85	8·2	1·45	3·0		2·7	1·57	4·0			30
1·85	8·2			1·38	2·6		4·2			31

MONTHLY DISCHARGE of Canoe Creek, near Salmon Arm, for 1912.

(Drainage area, 30 square miles.)

Month	Discharge in Second-feet.				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
January	4.2	2.1	2.7	.09	.10	166	
February	4.2	2.3	3.4	.11	.12	196	
March	4.8	2.8	3.3	.11	.13	203	
April	26.0	4.8	15.1	.51	.56	898	
May	31.4	8.2	22.1	.74	.85	1,359	
June	8.2	2.8	4.4	.15	.17	262	
July	3.7	2.6	3.1	.10	.12	191	
August	4.2	2.4	2.9	.10	.12	178	
The period							16

NOTE.—Ice conditions probably existed for short periods during January and February. Since figures given are deduced from a discharge curve applicable only to conditions of open flow, the discharges for these months may be slightly too large.

January and February, Accuracy "C"; the other months, Accuracy "B."

CHARTRAND CREEK (259).

Chartrand creek (also called Jack creek) has its source on the plateau south of Kamloops lake at an elevation of 4,000 feet, and discharges into Guichon creek from the east, 6 miles above Mamit lake, at an elevation of 3,300 feet. It is part of the Guichon-Nicola-Thompson drainage. The drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 25 square miles. Chartrand creek is an important irrigation stream in the Dry Belt; the summers are hot and dry, the winters long and very cold (-30° F.). There is no cultivation in the narrow valley of the creek, but the water is used in the Guichon valley. There are no storage facilities, but it would be practicable to divert the head-waters of the creek into the east fork of Three-mile creek for use in the Thompson valley. The creek is generally dry in the summer; in 1912, however, it ran about 2 second-feet all summer, and had a freshet in the spring of 75 second-feet for several days.

The river station of Chartrand creek was established September 16, 1911, by W. M. Carlyle, though no data were obtained until the spring of 1912. The measuring section is located at the bridge on the Kamloops-Mamit Lake road, about one-half mile from the mouth. A standard vertical staff gauge is located on the upstream side of the aforesaid bridge. The measurements were made by wading. This is a fair measuring section; the control is good, the banks high, the current uniform, though there is a possibility of the creek clogging during high water.

[illegible]

MONTHLY DISCHARGE of Chartrand Creek, near Mamit Lake, for 1912.
(Drainage area, 25 square miles.)

Month.	Discharge in Second Feet. Maximum	Minimum	Mean	Per sq. mile.	Run Off. Depth in inches on Drainage area	Total in acre-feet.	Rainfall. Inches.
May	82.0	7.5	32.2	1.[illegible]	1.49	1,980	
June	6.5	1.1	3.2	·13	·15	190	
July	2.1	0.6	1.3	·05	·06	81	
August	2.1	0.7	1.2	·05	·06	76	
September	1.1	0.3	0.9	·03	·01	52	
The period							12 to 18.

NOTE.—Accuracy, "A."

CHASE CREEK (260).

Chase creek is just at the easterly limit of the Dry Belt. It rises in the hills south of South Thompson river at an elevation of about 3,500 feet and, flowing in a general northerly direction for about 16 miles, discharges into the South Thompson at the town of Chase in township 21-13-6.

Chase creek is about 25 feet wide and 3.5 feet deep at high water in May and June, with a mean velocity of about 4.5 feet per second. At low water it goes down from 2 to 5 c.f.s.

The mean annual precipitation is about 15 inches. The summers are hot and dry, and irrigation is necessary; the winters are not severe, with a light snowfall. The creek is generally frozen for two or three months during the winter.

The Adams River Lumber Company has installed a water supply and fire protection system from Chase creek, with an 8-inch main, situated about 1½ miles up the creek, at an elevation of 260 feet above the flat. Four-inch laterals from the main are used to serve the town of Chase.

There are twelve water records from Chase creek, totalling some 2,650 miners inches (74 c.f.s.). In addition to the above-mentioned water system, there is only one diversion ditch for irrigation purposes, used by Messrs. Chase, Carlin and O'Brien. This ditch carried generally from 10 to 15 c.f.s. during 1911 and 1912, using some 2,500 acre-feet in 1911 and 2,000 acre-feet in 1912. The supply from Chase creek is good, and there is no contention over water rights.

About 1½ miles upstream there are two distinct falls, less than 100 feet apart. These falls are 34 feet and 28 feet high, respectively (measured by aneroid). By constructing a small dam just above the upper falls, small pondage could be secured, and a head of 75 feet obtained. A power site is available at the foot of the falls. Owing to the low flow of the stream in the late summer and winter, only a small development is possible. At present the town of Chase obtains its electric light from the plant at the mill, and it is improbable that the power on Chase creek will be used in the near future.

A regular gauging station was established on this stream on June 1, 1911, by C.E. Richardson, and has been since maintained during the open season. The gauge is a standard vertical staff 5 feet long, and is fastened to the cribbing on the upstream side of the C.P.R. tracks near Chase station. Measurements are made from the traffic bridge (on the road to the station) during high water, and by wading at other stages.

The gauge is located below both the water supply and irrigation diversions so as to obtain the flow of the stream above the diversions; from 10 to 15 c.f.s should be added during the month of June, July and August. The existing conditions at the station tend to give accurate results.

Discharge Measurements of Chase Creek, near Chase, B.C., for 1911 and 1912.

Date	Hydrographer	Meter No.	Width	Area of section	Mean velocity.	Gauge height.	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
1911							
June 1	C. E. Richardson	1048	23·0	61·1	4·4	2·70	269*
June 13	"	1048	23·5	45·3	4·1	2·22	185*
June 29	"	1048	23·5	29·7	1·5	0·89	43*
Aug. 2	"	1048	21·0	19·2	0·5	0·20	10·3*
Aug. 31	"	1048	8·1	3·5	1·0	0·23	3·5†
1912							
May 18	"	1048	24	65·1	4·55	2·75	297
June 13	"	1048	24	47	2·7	1·74	127

*Measurements from bridge.
†Wading measurement at different station.

DAILY GAUGE HEIGHTS AND DISCHARGE of Chase Creek, near Chase, for 1911.

Day	June.		July		August		September		October.		November	
	Gauge height	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1	2·65	262·	·95	45·0	·18	9·00	—·10	4·0	—·15	3·4	—·08·	4·4
2	2·95	317	·90	42·0	·20	10·0	—·10	4·0	—·12	3·8	—·10	4·0
3	2·80	288	·85	38·5	·18	9·6	—·10	4·0	—·10	4·0	—·10	4·0
4	2·28	195	·75	32·0	·15	9·0	—·10	4·0	—·08	4·4	—·10	4·0
5	2·05	160	·82	36·4	·15	9·0	—·15	3·4	—·30	2·0	—·10	4·0
6	1·88	137·	·75	32·0	·10	8·0	—·12	3·8	—·28	2·2	—·20	2·8
7	1·72	118·	·65	27·0	·12	8·4	—·10	4·0	·20	2·8	—·30	2·0
8	1·70	115	1·20	64·0	·20	10·0	—·05	5·0	·20	2·8	—·25	2·4
9	1·68	112	1·82	130	·25	11·5	—·05	5·0	·20	2·8	—·20	2·8
10	1·78	124·	1·88	137·	·30	13·0	—·05	5·0	—·15	3·4		
11	1·80	127	1·78	125·	·25	11·5	—·05	5·0	—·15	3·4		
12	1·98	150	1·60	102·	·25	11·5	—·02	5·6	—·05	5·0		
13	2·20	184	1·35	76·5	·25	11·5	—·12	3·8	—·10	4·0		
14	2·20	184	1·16	60·8	·25	11·5	—·20	2·8	—·15	3·4		
15	2·10	168·	1·02	49·6	·15	9·0	—·25	2·4	—·15	3·4		
16	2·00	153	·98	46·8	·10	8·0	—·30	2·0	—·20	2·8		
17	1·80	127·	·92	43·2	·10	8·0	—·30	2·0	—·25	2·4		
18	1·75	121	·82	36·4	0·0	6·0	—·30	2·0	—·25	2·4		
19	1·48	89·0	·75	32·0	·10	4·0	—·25	2·4	—·20	2·8		
20	1·22	65·6	·68	28·2	·28	12·4	—·20	2·8	—·15	3·4		
21	1·12	57·6	·65	27·0	·25	11·5	—·20	2·8	—·10	4·0		
22	1·15	60·0	·60	25·0	·20	9·0	—·20	2·8	—·10	4·0		
23	1·15	60·0	·68	28·2	·20	9·0	—·15	3·4	—·10	4·0		
24	1·05	52·0	·62	25·8	·20	9·0	—·15	3·4	—·10	4·0		
25	·98	46·8	·58	24·2	·20	9·0	·15	3·4	—·10	4·0		
26	·98	46·8	·52	21·8	·20	10·0	·20	2·8	—·05	5·0		
27	1·02	49·6	·48	20·2	—·20	2·8	—·20	2·8	—·05	5·0		
28	·98	46·8	·38	16·2	—·18	3·0	—·20	2·8	—·05	5·0		
29	·98	46·8	·32	13·8	—·12	3·8	—·18	3·0	—·05	5·0		
30	·95	45·0	·32	13·8	—·10	4·0	—·12	3·8	—·05	5·0		
31			·28	12·4	—·19	4·0			—·05	5·0		

SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Chase Creek, near Chase, B.C., for 1911.

(Drainage area, 100 square miles.)

Month	Discharge in Second-Feet				Run-Off		Rainfall
	Maximum	Minimum	Mean	Per sq. mile	Depth in inches on Drainage area.	Total in acre-feet	Inches
June	317	45	124	1.24	1.38	7379	
July	137	12.1	46	0.46	0.53	2804	
August	13	2.8	8.6	0.08	0.09	529	
September	5.6	2.0	3.5	0.03	0.03	208	
October	5.0	2.0	3.7	0.04	0.05	227	
The period							18

NOTE.—To the quantity of water in acre-feet should be added 2,500 acre-feet diverted above the gauging station and used for irrigation from May 1 to the end of August. Winter conditions set in on November 10.

Accuracy, "A."

DAILY GAUGE HEIGHTS AND DISCHARGE

Day.	March.		April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·30	14·0	0·05	7·2	2·0	155	1·97	152·0	0·40	17·0
2	0·30	14·0	0·05	7·2	1·92	147	1·85	137·0	0·40	17·0
3	0·25	12·5	0·07	7·6	2·00	155	1·77	127·0	0·47	19·8
4	0·27	13·1	0·10	8·0	2·10	170	1·72	122·0	0·72	32·2
5	0·32	14·6	6·10	8·0	2·07	165	1·60	105·0	0·92	44·4
6	0·37	16·1	0·12	8·6	2·25	192	1·60	105·0	0·97	47·9
7	0·45	19 0	0·15	9·5	2·42	223	1·60	105·0	1·00	50·0
8	0·50	21·0	0·20	11·0	2·72	285	1·57	102·3	1·02	51·6
9	0·45	19·0	0·22	11·6	2·92	335	1·55	100·0	1·00	50·0
10	0·10	17·0	0·32	14·6	2·95	312	1·50	96·0	1·05	54·0
11	0·37	16·1	0·52	22·0	2·67	273	1·50	96·0	1·00	50·0
12	0·40	17·0	0·77	35·2	2·62	260	1·55	100·0	0·87	41·2
13	0·40	17·0	0·95	46·5	2·67	273	1·72	122·0	0·65	28·5
14	0·35	15·5	1·97	55·6	2·85	317	1·77	127·0	0·57	24·5
15	0·35	15·5	1·07	55·6	3·25	435	1·87	140·0	0·50	21·0
16	0·30	14·0	1·12	59·8	3·40	485	2·02	158·0	0·42	17·8
17	0·35	15·5	1·20	67·0	3·20	420	2·00	155·0	0·32	14·6
18	0·30	14·0	1·27	73·3	2·72	285	1·85	137,0	0·30	14·0
19	0·30	14·0	1·35	81·0	2·52	239	1·67	115·0	0·27	13·1
20	0·25	12·5	1·40	86·0	2·15	177	1·37	83·0	0·20	11·0
21	0·25	12·5	1·52	97·8	2·25	192	1·05	54·0	0·20	11·0
22	0·20	11·0	1·57	102·3	2·37	214	0·87	41·2	0·25	12·5
23	0·13	8·9	1·60	105·0	2·67	273	0·80	37·0	0·27	13·1
24	0·10	8·0	1·67	115·	3·20	420	0·87	41·2	0·30	14·0
25	0·05	7·2	1·80	130·	3·15	402	0·72	32·2	0·25	12·5
26	0·03	7·0	1·82	133·	3·00	355	0·60	26·0	0·20	11·0
27	−0·05	5·7	1·80	130·	2·90	330	0·57	24·5	0·17	10·1
28	−0·05	5·7	1·85	137·	2·72	285	0·52	22·0	0·15	9·5
29	−0·10	5·0	1·95	150·	2·50	235	0·50	21·0	0·15	9·5
30	−0·10	5 0	2·02	158·	2·20	185	0·42	17·8	0·15	9·5
31	−0·10	5·0			2·05	162		. .	0·15	9·5

of Chase Creek, near Chase, B.C., for 1912.

August.		September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
0·10	8·0	0·0	6·5	0·2	3·5	0·1	8·0	0·1	8·0	1
0·10	8·0	·15	9·5	− 0·2	3·5	0·1	8·0	0·1	8·0	2
0·07	7·5	·45	19·0	− 0·2	3·5	0·1	8·0	0·1	8·0	3
0·05	7·2	·47	19·8	− 0·2	3·5	0·08	7·7	0·1	8·0	4
0·0	6·5	·42	17·8	− 0·2	3·5	0·05	7·2	·05	7·2	5
− ·10	5·0	·40	17·0	− 0·2	3·5	0·0	6·5	− 0·05	5·8	6
− ·20	3·5	·40	17·0	− 0·2	3·5	0·0	6·5	− 0·2	3·5	7
− ·20	3·5	·65	28·5	− 0·2	3·5	0·0	6·5	Freeze up.		8
− ·20	3·5	·75	34·0	− 0·2	3·5	− 0·1	5·0			9
− ·20	3·5	·62	27·0	− 0·2	3·5	− 0·1	5·0			10
− ·20	3·5	·60	26·0	− 0·2	3·5	− 0·1	5·0			11
− ·25	2·7	·57	24·5	− 0·2	3·5	− 0·1	5·0			12
− ·25	2·7	·47	19·8	− 0·2	3·5	− 0·1	5·0			13
− ·25	2·7	·27	13·1	− 0·2	3·5	− 0·1	5·0			14
− ·25	2·7	·20	11·0	− 0·2	3·5	− 0·05	5·8			15
− ·25	2·7	·15	9·5	− 0·2	3·5	− 0·05	5·8			16
− ·25	2·7	·10	8·0	− 0·1	5·0	− 0·1	5·0			17
·15	9·5	·07	7·5	− 0·2	11·0	− 0·1	5·0			18
·10	8·0	·02	6·8	− 0·2	11·0	− 0·1	5·0			19
·0	6·5	− ·05	5·7	− 0·2	11·0	0	6·5			20
− ·05	5·7	− ·12	4·7	− 0·2	11·0	0·1	8·0			21
− ·15	4·2	− ·15	4·3	− 0·2	11·0	0·1	8·0			22
− ·20	3·5	− ·15	4·3	− 0·2	11·0	0·1	8·0			23
− ·25	2·7	− ·17	1 0	− 0·2	11·0	0·1	8·0			24
− ·25	2·7	− ·20	3·5	− 0·15	9·5	0·1	8·0			25
− ·25	2·7	− ·20	3·5	− 0·15	9·5	0·1	8·0			26
− ·25	2·7	− ·20	3·5	− 0·1	8·0	0·0	6·5			27
− ·25	2·7	− ·22	3·2	− 0·1	8·0	0 0	6·5			28
− ·25	2·7	− ·25	2·7	− 0·1	8·0	0·05	7·2			29
− ·17	4 0	− ·25	2·7	− 0·1	8·0	0·1	8·0			30
0·0	6·5			− 0·1	8·0					31

MONTHLY DISCHARGE of Chase Creek, near Chase, B.C., for 1912.

(Drainage area, 100 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
March	21·	5·	12·7	·12	·14	781·	
April	158	7·2	64	·64	·71	3830	
May	485	147·0	270	2·70	3·10	16600	
June	158	17·8	90·	·90	1·00	5350	
July	54·	9·5	24·	·24	·26	1470	
August	9·5	2·7	4·5	·04	·05	277	
September	34·	2·7	12·1	·12	·13	720	
October	11·	3·5	6·4	0·06	0·07	393	
November	8·	5·0	6·6	0·07	0·07	393	
The period							20

NOTE.—To the quantity of water in acre-feet should be added 2,000 acre-feet diverted above the gauging station and used for irrigation in May, June, July and part of August.
Accuracy, "A."

CHEHALIS RIVER (117).

Chehalis river has its source in Chehalis lake, at an elevation of 700 feet and discharges into Harrison river near Harrison Mills, at an elevation of between 30 and 40 feet. It is part of the Harrison-Fraser drainage; the drainage area, as measured from the Railway Belt map, dated January 1, 1911, scale 7·89 miles per inch, is 200 square miles. The annual precipitation is about 80 to 90 inches; there is a very heavy snowfall in winter in all except the lowest parts of the watershed, and the winter conditions are fairly severe. At the mouth, however, the stream is open all the year round. Chehalis river, from its source in a rough mountainous country, flows through a wide valley, containing very fine timber, to Chehalis lake. Stadia creek, after tumbling over a 200-foot bluff, enters from the west in this valley. Chehalis lake is a deep mountain lake about seven miles long, with rocky cliffs rising from the water's edge. It is an excellent storage site for power purposes. The lake is well stocked with fish. At the lower end of the lake there is a canyon; dams could be constructed at several points in the canyon. Five miles below the lake, the west fork or Statlu creek enters from the west, a flashy stream, without a lake to control it.

For the last mile or so of its course, the Chehalis flows through a delta, and splits up into a number of sections, with frequent changes of its channel. The deposits from the Chehalis are gradually filling up Harrison bay, and at low water in Harrison river very extensive flats are exposed. The flow from Harrison lake through Harrison river is largely controlled by the bar which the Chehalis has formed across the Harrison; Harrison river rises and falls with the Fraser, and during low water this bar at the mouth of the Chehalis is a great hindrance to navigation and logging on Harrison river, which is the connecting link between 30 miles of navigation on Harrison lake and the Fraser.

To reach the Chehalis river it is necessary to go by water either from Harrison Mills or Harrison Hot Springs; there are no good roads yet, though one has been surveyed. From the mouth of the river, there is an old logging road for five miles to an abandoned camp at Boulder creek. This road has been repaired sufficiently to serve as a pack trail, and has recently been extended to Chehalis lake.

The Chehalis valley was surveyed by A. W. Johnston in 1903, while he was locating the north boundary of the Railway Belt, but with the exception of two ranches on the delta, there is no settlement. The river, at present, used for lumbering only, is being investigated by engineers as to its power possibilities; there is a 650-foot head in 11 miles, with an excellent storage reservoir in Chehalis lake. The river station was established November 4, 1911, by C.G. Cline. It is located one mile from the mouth, opposite the foot of the first hill on the trail up the river. A chain gauge, supported from a pole fastened to two ties, is located on the right bank; its datum is referred to three bench-marks. Measurements are made by wading, except at high water, when cable measurements are made from a canoe one-quarter mile below the gauge. The measuring section is fair; the control is good, the banks high on one side, current uniform, and one channel at low water. At high water, however, the river overflows its left bank and forms two channels. The bed of the stream is liable to cut and shift, especially during the freshet.

The power possibilities of Chehalis river are being investigated by the Vancouver Power Company. The C.P.R. has also made application for power privileges on the river.

DISCHARGE MEASUREMENTS of Chehalis River, one mile from mouth, for 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1911.							
Dec. 11	K. H. Smith	1057	101	273	3·7	3·8	1,021
1912.							
Mar. 8	C. G. Cline	1046	110	162	1·82	2·7	295
July 5	"	1046	123	221	2·4	3·07	535
Sept. 11	"	1046	105	248	2·4	2·9	594
Nov. 23	"	1048	140	600	4·8	1·95	2·910
Dec. 4	"	1048	130	343	3·6	3·92	1220

DAILY GAUGE HEIGHTS AND DISCHARGE of Chehalis River, one mile from mouth, for 1911.

Day.	November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		290	4·8	2,620
2		290	4·55	2,160
3		290	4·3	1,760
4	2·65	290	4·2	1,610
5	2·65	290	4·25	1,685
6	3·9	1,210	4·6	2,250
7	4·7	2,430	4·55	2,160
8	4·35	1,835	5·7	4,550
9	3·4	730	5·2	3,430
10	3·2	580	4·9	2,820
11	3·1	520	4·8	2,620
12	2·9	410	4·5	2,070
13	2·8	360	4·2	1,610
14	2·8	360	3·9	1,210
15	2·85	385	3·8	1,100
16	5·3	3,640	3·7	900
17	5·8	4,780	3·5	810
18	7·8	9,500	3·6	900
19	5·4	3,860	4·0	1,330
20	5·8	4,780	3·65	945
21	5·5	4,090	3·5	810
22	5·25	3,555	3·8	1,100
23	4·8	2,620		1,000
24	4·55	2,160		1,000
25	6·0	5,250		1,000
26	5·05	3,120		1,000
27	4·75	2,525		1,000
28	4·3	1,760		1,000
29	4·05	1,400		1,000
30	4·4	1,910		1,000
31				1,000

MONTHLY DISCHARGE of Chehalis River one mile from mouth, for 1911.

Drainage area, 200 square miles.

Month.	Discharge in Second Feet				Run-off		Rainfall
	Maximum	Minimum	Mean	Per square mile	Depth in inches on Drainage area	Total in acre-feet	Inches
November	4,500	200	2,173	[illegible]	[illegible]	129,000	
December	4,550	[illegible]	[illegible]	[illegible]	[illegible]	98,200	
The period							70

NOTE.—Accuracy B.

DAILY GAUGE HEIGHT AND DISCHARGE OF

Day.	March.		April.		May.		June.		July.	
	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge he.	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·8	360	3·21	587	3·51	819	3·13	538
2			2·8	360	3·11	526	3·36	698	3·14	5[illegible]
3	.	....	3·01	466	3·11	526	3·31	658	3·14	5[illegible]
4	.	....	2·91	415	3·12	532	3·32	666	3·15	550
5	.	....	2·92	420	3·07	502	3·32	666	3·15	550
6			2·92	420	3·12	532	3·27	629	3·16	556
7	2·7	310	2·98	450	3·43	754	3·28	36	3·11	526
8	2·6	270	2·98	450	3·73	1,023	3·33	674	2·97	445
9	2·6	270	3·03	478	3·83	1,152	3·33	674	2·87	395
10	2·5	240	3·04	484	3·74	1,034	3·34	682	2·88	400
11	2·4	210	3·04	484	3·64	936	3·44	762	2·88	400
12	2·4	210	3·04	484	3·64	936	3·64	936	2·94	430
13	2·35	200	3·05	490	3·75	1·045	3·95	1,270	3·10	520
14	2·37	204	2·95	435	3·85	1,155	3·75	1,045	3·00	460
15	2·37	204	3·05	490	3·95	1,270	3·65	945	3·10	520
16	2·37	204	2·96	440	3·81	1,111	3·66	954	3·05	490
17	2·42	216	3·01	466	3·66	954	3·56	864	2·9	410
18	2·53	249	3·01	466	3·46	778	3·37	706	2·7	310
19	2·53	249	3·02	472	3·47	786	3·37	706	2·55	255
20	2·44	222	3·02	472	3·67	963	3·38	714	2·5	240
21	2·44	222	2·87	395	3·82	1,122	3·58	882	2·5	240
22	2·40	210	2·68	302	3·78	1,078	3·69	981	2·5	240
23	2·35	200	2·68	302	3·68	972	3·49	802	2·55	2[illegible]5
24	2·36	202	2·68	302	3·68	972	3·40	730	2·7	310
25	2·46	228	2·69	306	3·59	891	3·20	580	2·7	310
26	2·57	261	2·79	355	5·59	891	3·21	587	2·7	310
27	2·67	298	2·79	355	3 59	891	3·31	658	2·6	270
28	2·73	325	2·80	360	3·85	1,155	3·32	666	2·6	270
29	2·73	325	2·90	410	3·70	990	3·22	594	2·5	240
30	2·79	355	3·30	650	3·70	990	3·23	601	2·45	225
31	2·74	330			3·70	990	....		2·4	210

SESSIONAL PAPER No. 25f

Chehalis River, one mile from mouth, for 1912.

August.		September.		October.		November.		December.		Day.
Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
2·4	210	4·0	1,330	1·9	135	3·3	650	4·3	1,760	 1
2·35	200	3·9	1,210	1·9	135	3·2	580	4·8	2,620	 2
2·3	190	3·6	900	2·0	145	3·15	550	4·4	1,910	 3
2 3	190	3·5	810	2·0	145	3·2	680	3·9	1,210	 4
2·3	190	3·4	730	2·0	145	3·4	730	3·7	990	 5
2·2	175	3·25	615	2·2	175	4·5	2,070	3·5	810	 6
2·15	167	3·2	580	2·4	210	4·2	1,610	3·3	650	 7
2·1	160	3·3	650	3·0	460	4·0	1,330	3·1	520	 8
2·2	175	3·1	520	2·7	310	3·85	1,155	3·0	460	 9
2·6	270	2·9	410	2·6	270	3·8	1,100	2·9	410	10
2·7	310	2·8	360	2·5	240	4·0	1,330	3·05	490	11
2·6	270	2·75	335	2·45	225	4·1	1,470	3·0	460	12
2·5	240	2·7	310	2·4	210	6·0	5·250	4·0	1,330	13
2·5	240	2·6	270	2·5	240	5·0	3,020	3·8	1,100	14
2·7	310	2·6	270	2·7	310	4·55	2,160	2·8	360	 15
3·3	650	2·4	210	3·4	730	4·3	1,760	2·9	410	 16
3·2	580	2·3	190	4·2	1,610	4·2	1,610	4·0	1,330	17
3·0	460	2·25	182	3·9	1,210	5·0	3,020	4·2	1,610	13
2·8	360	2·25	182	4·1	1,470	6·0	5,250	3·9	1,210	19
2·7	310	2·2	175	3·8	1,100	5·9	5 010	3·7	990	20
2·5	240	2·2	175	3·7	990	6·1	5·500	3·6	900	21
2·5	240	2·2	175	3·5	810	5·4	3,860	3·35	690	22
2·5	240	2·1	160	3·5	810	4·85	2,720	3·4	730	23
2·5	240	2·05	152	3·6	900	4·95	2,920	3·4	730	24
2·5	240	2·0	145	4·1	1,470	4·6	2,250	3·5	810	25
2·4	210	1·9	135	3·9	1,210	4·3	1,760	3·55	855	26
2·35	200	1·9	135	3·6	900	4·05	1,400	3·7	990	27
2·25	182	1·9	135	3·5	810	3·9	1,210	4·0	1,330	28
2·4	210	1·9	135	3·5	810	5·75	1,045	3·9	1,210	29
2·8	360	1·8	130	3·4	730	3·6	900	3·8	1,100	30
4·2	1,610	....	....	3·3	650	....	....	3·7	990	31

MONTHLY DISCHARGE of Chehalis River, one mile from mouth, for 1912.
(Discharge area, 200 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
March	355	200	248	1·2	1·4	15,250	
April	650	302	425	2·1	2·3	25,300	
May	1,270	502	904	4·5	5·2	55,600	
June	1,270	580	760	3·8	4·2	45,200	
July	556	210	386	1·9	2·2	23,700	
August	1,610	160	310	1·5	1·7	19,060	
September	1,330	130	390	1·9	2·1	23,200	
October	1,610	135	631	3·1	3·6	38,800	
November	5,250	550	2,127	10·6	11·8	126,500	
December	2,620	410	999	5·0	5·8	61,400	
The period							70

NOTE.—See also miscellaneous measurements on Chehalis River, just below Chehals Lake. Open conditions exist all year.
Accuracy, "A" and "C."

CHERRY CREEK.

Cherry creek has its source in the hills south of Kamloops lake, at an elevation of 3,800 feet, and discharges into Kamloops lake, at an elevation of 1,120 feet. It is part of the Thompson drainage; the drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 70 square miles; of this area 33 square miles is above the gauge. Cherry creek has the following tributaries: Alkali creek, entering from the left; Dairy and Pendleton creeks, entering from the right going upstream. Cherry creek, as well as its tributaries, is situated in the most arid section of the Dry Belt; the summers are hot and dry, the winters long and cold (—20 F.); the precipitation varies from 8 inches, near the mouth, to 12 inches at the headwaters.

Cherry creek is a contentious irrigation stream about 12 miles long. The upper 6 miles consists of dry range hills with little irrigable land, but the lower half of the stream flows through wide benches, which only require water to become fertile agricultural lands. In a wet season like 1912, the creek will run for six or seven months at the station; in a dry season the stream cannot be depended on for more than three months, and then for a mean discharge of only 2 second-feet. In different sections of the stream conditions are different; near the mouth the creek runs all year; in other places the stream will be absolutely dry, while running a hundred yards above and below. Apparently there is a large amount of seepage in proportion to the size of the stream. This fact makes the measurement of the discharge very difficult.

Cherry creek has excellent storage facilities in the following lakes, situated near the head-waters of the creek: Big Meadow reservoir, with a capacity of 1,250 acre-feet; Chuwhels lake, with a capacity of 525 acre-feet; Roper lake, with a capacity of 225 acre-feet; Andrew lake and Cornwall lake, which have not been dammed as yet. These lakes, however, are so far upstream that their catchment basins are small, and only a little water can be conserved, the reservoirs rarely filling to their capacity. Cherry creek is greatly over-recorded; the many records on the creek call for over 4,400 miner's inches, or over 120 second-feet; while the mean flow of recent years has been less than 10 second-feet during the whole irrigation season. To further increase the water supply of the Cherry Creek district, records were taken out by Cherry-Creek interests to divert water from Big Fish, and Face lakes, which lakes are part of the Guichon drainage area flowing southerly into the Nicola district. It is proposed to divert the water of these lakes across the divide, and in a northerly direction to the Beaton and Cherry Creek estates. (For further information see remarks on Greenstone creek.) On May 15, during the freshet, the storage dam on Chuwhels lake failed, and washed out the gauge. The channel, too, was entirely altered.

The river station on Cherry Creek was established June 5, 1911, by W. M. Carlyle. The measuring section is located above all diversions, on the Kensington ranch, just beside the gauge. The gauge is fastened about 100 feet above the Cornwall diversion, on the right bank. This gauge was washed out by the above mentioned dam failure, and a temporary one was located to complete the year 1912. All the measurements are made by wading. This would make an excellent measuring section, but for the possibility of seepage. The control is good, the current uniform, the banks high; and there is only one channel. The datum of the gauge is referred to three bench-marks.

Discharge Measurements of Cherry Creek, at Cornwall's ranch, for 1911 and 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1911.							
June 5	W. M. Carlyle............	1044	10·0	5·95	1·29		7·0
" 21	"	1044	9·0	4·4	0·9		4·0
July 21	"	1044	2·4	1·0	0·3		0·3
1912.							
April 24	H. J. E. Keys............	1057	8·0	5·0	0·3	0·6	1·5
May 8	"	1057	10·0	13·0	5·7	2·2	74·0
" 17	"	1057	10·0	16·0	4·3	2·8	69·0*
" 25	"	1057	11·5	7·0	3·8	2·12	27·4
" 28	"	1057	9·0	6·0	3·1	1·90	19·7
June 13	"	1057	7·5	2·6	1·50	1·20	4·0
" 26	"	1057	2·0	0·5	1·0	1·10	0·5
July 4	"	1057	7·0	2·8	1·4	1·60	4·1
" 11	"	1057	6·5	2·5	1·5	1·61	3·7
" 21	"	1057	6·2	1·8	1·1	1·50	2·0
Aug. 1	"	1057	4·0	1·1	1·5	1·46	1·7
" 9	"	1057	8·0	4·4	2·7	1·80	12·0
" 27	"	1057	3·0	0·6	1·0	1·40	0·6

* New Gauge. Old one washed out on May 15, when dam on Chuwhels Lake went out. The channel was so altered that a new discharge curve had to be made.

Daily Gauge Heights and Discharge of Cherry Creek at Cornwall's Ranch for 1911.

Day.	June.		July.		August.	
	Gauge height.	Discharge.	Guage height.	Discharge.	Guage height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	0·6	1·86	0·4	0·26
2	....	....	0·6	1·86	0·38	0·23
3	....	....	0·55	1·36	0·38	0·23
4	....	....	0·56	0·86	0·38	0·23
5	1·0	9·43	0·48	0·74	0·38	0·23
6	0·9	7·06	0·48	0·74	0·38	0·23
7	1·0	9·43	0·45	0·56	0·38	0·23
8	0·85	0·03	0·45	0·56	0·4	0·26
9	0·85	6·03	0·45	0·5,	0·4	0·26
10	0·8	5·00	0·45	0·56	0·38	0·23
11	0·9	7·06	0·45	0·56	0·36	0·19
12	1·0	9·43	0·45	0·56	0·36	0·19
13	0·9	7·06	0·42	0·38	0·35	0·17
14	0·85	6·03	0·42	0·38	0·35	0·17
15	0·9	7·06	0·42	0·38	0·32	0·12
16	0·85	6·03	0·42	0·38	0·32	0·12
17	0·85	6·03	0·42	0·38	0·32	0·12
18	0·85	6·03	0·42	0·38	0·3	0·08
19	0·8	5·00	0·42	0·38	0·3	0·08
20	0·75	4·11	0·4	0·26	0·3	0·08
21	0·75	4·11	0·4	0·26	0·3	0·08
22	1·0	9·43	0·4	0·26	0·3	0·08
23	0·7	3·22	0·4	0·26	0·28	0·07
24	0·65	2·54	0·4	0·26	0·28	0·07
25	0·65	2·54	0·4	0·26	0·25	0·05
26	0·65	2·54	0·4	0·26	0·25	0·05
27	0·62	2·13	0·4	0·26	0·2	0·02
28	0·62	2·13	0·4	0·26	0·15	0·00
29	0·62	2·13	0·4	0·26	0·15	0·00
30	0·62	2·13	0·4	0·26	0·1	0·00
31	..	....	0·4	0·26	0·0	0·00

Monthly Discharge of Cherry Creek, at Cornwall's Ranch, for 1911.
(Drainage area, 33 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	9·43	2·13	5·5	0·17	0·2	327·3	
July	1·86	0·26	0·53	0·016	0·02	32·5	
August	0·26	0·00	0·13	0·004	0·004	8·0	
The period	..	....	....	....	....	....	9

Note.—Entire drainage area, Cherry creek, is 70 square miles, and 33 square miles represents drainage area above gauge. Station established on June 5, after the maximum flood was over. The creek became dry about the end of August. The year 1911 was a dry year, the run-off of Cherry Creek district being smaller than the average. The flow is controlled by several storage reservoirs near the head of the creek.

Accuracy, "B."

DAILY DISCHARGE of Cherry Creek, at Cornwall's Ranch, for 1912.

Day.	April.	May.	June.	July.	August.	September.
	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1		12·2	16·5	0·95	0·95	0·2
2		18·3	15·5	5·6	0·95	0·95
3		20·6	14·5	4·8	0·95	0·95
4		20·0	13·5	4·0	0·95	0·2
5		23·0	12·5	5·6	0·95	0·2
6		33·0	11·5	5·6	0·95	0·2
7		33·0	10·5	7·2	4·00	0·2
8		61·0	9·4	5·6	20·0	0·2
9		74·9	8·3	5·6	16·0	0·2
10		74·0	7·2	4·0	4·0	0·2
11		56·0	6·1	4·0	4·0	0·2
12		50·0	5·0	2·9	1·7	0·2
13		50·0	4·0	2·9	0·95	0·2
14		50·0	3·7	2·9	0·95	0·2
15		200·0	3·5	1·7	0·95	0·2
16		100·0	3·2	1·7	0·95	
17		71·0	3·0	1·7	0·95	
18		64·0	2·7	0·95	1·7	
19		57·0	2·4	0·2	0·95	
20		64·0	2·1	0·2	0·2	
21		64·0	1·8	1·7	0·2	
22		64·0	1·6	1·7	0·2	
23		57·0	1·3	2·9	1·2	
24	3·0	57·0	1·0	4·0	0·2	
25	4·8	51·0	0·8	4·0	0·2	
26	6·0	19·7	0·5	2·9	0·2	
27	6·0	19·7	0·93	2·9	0·2	
28	6·5	19·7	0·95	2·9	0·2	
29	10·5	19·7	0·95	1·7	0·2	
30	10·5	18·5	0·95	1·7	0·95	
31		17·5		0·95	0·2	

MONTHLY DISCHARGE of Cherry Creek, at Cornwall's Ranch, for 1912.
(Drainage area, 33 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	10·5	0·0	1·57	0·05	0·06	95·2	
May	200·0	12·2	49·6	1·5	1·72	3,050·0	
June	16·5	0·5	5·5	0·17	0·19	327·3	
July	7·2	0·2	3·1	0·1	0·11	190·6	
August	20·0	0·2	2·1	0·06	0·07	129·1	
September	0·9	0·2	0·2	0·006	0·01	11·9	
The period					2·1	....	12

NOTE.—Drainage area of Cherry creek is 70 square miles; but above the gauge only 33 square miles. The maximum discharge on May 15, 1912, was due to the failure of a storage dam at the head of the creek. The effect of this large flow was to wash out the gauge, and so alter the channel that a new discharge curve had to be made. The normal maximum discharge for the month of May was 74 second feet. To obtain the total discharge of Cherry creek drainage, add the flow of Alkali creek, Dairy creek and Pendleton creek.

Accuracy, "B."

CHILLIWACK RIVER.

Chilliwack river has its source in Chilliwack lake, at an elevation of 2,080 feet. It passes through Vedder River channel and empties into Sumas lake, which is only about 100 feet above sea-level. The drainage area is about 450 square miles, about one-quarter of the watershed lying in the state of Washington. The district is very humid, the precipitation being from 40 inches to 70 inches per annum. The water is at present unused, but there are power possibilities on the stream; it may also be used for logging.

The control of the flow of this river is of great importance in connection with the Sumas Dyking Project. Chilliwack river is subject to severe floods and, owing to its flat grade on the lower reaches, is a source of considerable damage to the rich farming districts in that locality. For the upper two-thirds of its length the river is separated from the valley of the Fraser by the Cheam mountains, the highest peak of which rises to an elevation of 9,000 feet. Opposite, on the south, Mount Baker rises abruptly to an even greater height. The bottom slopes of the valley are well covered with timber, some of it excellent quality. A wagon road has been constructed from the lower end of the valley, near Chilliwack, some eight miles up the river; beyond this there are evidences of an old trail, very much overgrown, and impassable in many places. The slopes of the valley in its lower reaches are characterized by high bluffs of sedimentary or glacial origin, subject to enormous slides or slips. The stream has a fast current, and its bed is composed of large boulders that have been washed out of the many slides along its course. The elevation of Chilliwack lake is 2,080 feet, the shores and adjacent slopes being covered with alder and brush. The lake has an area of about 2,600 acres.

The lower reaches of this river seem to have been changed, very much due to dykes and other artificial conditions; previously it seems to have spread over the country in a number of channels, most of which finally found their way to the Fraser.

Chilliwack river used to flow through what is now called Luckaluck channel to the Fraser. Some twenty years ago the river was dammed and diverted by the residents living along that channel (near Sardis), and made to flow through the channel of Vedder creek into Sumas lake. And indeed the Chilliwack is locally referred to as Vedder river.

There are doubtless excellent power possibilities on Chilliwack river, but on account of inaccessibility and the probable high cost of development they have not been carefully investigated.

The station was established on November 14, 1911, by K. H. Smith, and is located about 6 miles from the town of Chilliwack, about 300 yards above the highway bridge known as Vedder river crossing. The gauge is a standard vertical staff gauge, 8 feet long, and is attached to a rock-filled crib.

Measurements are made by current meter from a canoe suspended from a cable attached to the cribbing, to which the gauge is secured, or by using a special traveller on the cable, from which the meter is suspended.

The banks are moderately high and are protected by timber cribbing, and the stream is confined to a single channel. There are two bench-marks which are referred to the datum of the gauge.

DISCHARGE MEASUREMENTS of Chilliwack River, Three Miles above Mouth, for 1911-12.

Date	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Dec. 18	K. H. Smith	1057	76	450	2·6	1·7	1180
1912.							
Mar. 21	C. G. Cline	1016	65	420	1·8	1·0	750
Mar. 22	"	1016	65	508	1·5	1·8	774
July 8	"	1016	82	660	4·7	2·9	3·090
Aug. 30	"	1046	65	550	2·0	1·6	1·120
Nov. 21	"	1048	85	680	5·3	3·15	3·640

DAILY GAUGE HEIGHT AND DISCHARGE of Chilliwack River, Three Miles Above Mouth, for 1911.

(Drainage area, 450 square miles.)

Day.	November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·2	1750
2			2·2	1750
3			2·1	1620
4			2·1	1620
5			2·15	1685
6			2·15	1685
7			2·0	1500
8			2·5	2250
9			2·5	2250
10			2·3	1900
11			2·2	1750
12			2·1	1620
13			2·0	1500
14			1·9	1390
15			1·9	1390
16	0·9	730	1·8	1290
17	2·5	2,250	1·7	1200
18	6·2	11,050	1·6	1120
19	4·6	7,040	1·8	1290
20	4·2	6,020	1·7	1200
21	3·6	4,570	1·6	1120
22	3·15	3,510	1·95	1445
23	2·7	2,630	2·2	1750
24	2·45	2,400	1·9	1390
25	2·9	3,020	1·8	1290
26	3·4	4,100	1·7	1200
27	2·9	3,020	1·7	1200
28	2·6	2,440	1·6	1120
29	2·3	1,900	1·5	1040
30	2·2	1,750	1·5	1040
31			1·4	970

MONTHLY DISCHARGE of Chilliwack River, Three Miles Above Mouth, for 1911.

(Drainage area, 450 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
December	2250	970	1,462	3·2	3·7	89,800	
The period							85

NOTE.—Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·4	970	2·6	2,440	1·5	1,040	1·2	860	1·6	1,120	3·2	3,650
2	1·35	940	2·4	2·070	1·4	970	1·4	970	1·6	1·120	3·2	3,650
3	1·3	910	2·3	1,900	1·4	970	1·4	970	1·6	1,120	3·2	3,650
4	1·3	910	2·2	1,750	1·3	910	1·3	910	1·6	1·120	3·2	3,650
5	1·2	860	2·2	1·750	1·3	910	1·3	910	1·7	1,200	3·6	4,570
6	1·2	860	2·1	1,620	1·3	910	1·3	910	1·7	1,200	4 0	5,530
7	1·15	835	2·2	1,750	1·3	910	1·3	910	2·1	1,620	4·4	6,530
8	1·0	810	2·3	1,900	1·3	910	1·4	970	3·1	3·430	5·1	8,300
9	1·15	835	2·4	2,070	1·2	860	1·4	970	3·6	4,570	4·6	7,040
10	1·1	810	2·9	3·020	1·2	860	1·5	1,040	3·2	3,650	4·4	6,530
11	1·1	810	2·6	2,440	1·2	860	1·6	1·120	3·1	3·430	4·4	6,530
12	1·2	860	2·5	2·250	1·2	860	1·5	1,040	3·5	4,340	5·0	8,050
13	1·4	970	2·4	2·070	1·2	860	1·5	1,040	4·0	5·530	4·6	7,040
14	1·95	1,445	2·4	2,070	1·2	860	1·5	1,040	4·7	7,290	4·4	6,530
15	2·0	1,500	2·4	2,070	1·2	860	1·4	970	5·3	8,800	4·0	5,530
16	2·05	1,560	2·5	2,250	1·2	860	1·4	970	4·3	6·270	3·8	5,040
17	1·9	1,390	2·6	2·440	1·2	860	1·4	970	3·7	4·800	3·6	4,570
18	1·7	1,200	2·5	2,250	1 2	860	1·4	970	3 ~	4,800	4·2	6,020
19	1·6	1,120	2·3	1,900	1·1	810	1·4	970	4	6,530	4·7	7,290
20	1·9	1,390	2·2	1,750	1·1	810	1·4	970	4·	7,290	5·4	9,050
21	1·8	1,240	2·1	1,620	1·0	770	1·4	970	4·7	7,290	5·3	8,800
22	1·6	1,120	2·2	1,750	1·0	770	1·4	970	4·2	6,020	4·4	6,530
23	1·6	1,120	2·2	1,750	1·0	770	1·4	970	3·9	5,280	4·3	6,270
24	2·0	1,500	1·9	1,390	1·0	770	1·4	970	3·6	4,570	4·7	7,290
25	3·2	3,650	1·9	1,390	1·1	810	1·4	970	3·8	5,040	5·3	8,800
26	2·6	2,440	1·7	1,200	1·2	860	1·4	970	4·9	7,790	5·3	8,800
27	2·3	1,900	1·7	1,200	1·2	860	1·4	970	4·7	7,290	5·2	8,550
28	2·5	2·250	1·6	1,120	1·2	860	1·4	970	4·3	6,270	4·1	5,770
29	3·1	3,430	1·5	1,040	1·2	860	1·5	1,040	3·7	4·800	4·2	6,020
30	3·5	4,340	.....	.....	1·2	860	1·6	1,120	3·5	4,340	4·2	6,020
31	2·9	3,020	.....	.....	1·2	860	...	...	3·4	4,100	.....	....

Chilliwack River, Three Miles above mouth, for 1912.

July.		August.		September.		October.		November.		December.		
Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Day
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec-ft.	Feet.	Sec.-ft.	
3·8	5,040	2·0	1,500	1·6	1,120	1·0	770	1·2	860	2·2	1,750	1
4·0	5·530	2·0	1,500	1·8	1·290	1·0	770	1·2	860	2·2	1,750	... 2
3·6	4,570	1·9	1,390	2·0	1,500	1·0	770	1·2	860	2·2	1,750	... 3
3·2	3,650	1·8	1,290	1·8	1,290	1·1	810	1·2	860	2·2	1,750	... 4
3·4	4,100	1·8	1,290	1·7	1,200	1·1	810	1·2	860	2·0	1,500	... 5
3·3	3,870	1·7	1,200	1·5	1,040	1·1	770	1·2	860	1·9	1,390	... 6
3·3	3,870	1·7	1,200	1·5	1,040	1·0	770	1·3	910	1·8	1,290	... 7
3·0	3,230	1·7	1,200	1·5	1,040	1·0	770	1·3	910	1·7	1,200	... 8
3·1	3,430	2·1	1,620	1·5	1,040	1·0	770	1·3	910	1·7	1,200	... 9
3·1	3,430	2·0	1,500	1·4	970	1·0	770	1·4	970	1·7	1,200	...10
3·0	3,230	2·4	2,070	1·4	970	1·0	770	1·45	1,005	1·7	1,200	...11
2·9	3,020	2·0	1,500	1·3	910	1·0	770	1·6	1,120	1·75	1,245	...12
3·3	3,870	1·9	1,390	1·3	910	1·0	770	4·1	5·770	1·75	1,245	...13
3·2	3,650	1·7	1,200	1·3	910	1·0	770	3·2	3·650	1·65	1,160	...14
3·0	3,230	1·7	1,200	1·3	910	0·9	730	2·8	2,820	1·65	1,160	...15
3·0	3,230	1·9	1,390	1·2	860	1·0	770	2·2	1,750	1·6	1,120	...16
2·9	3,020	2·2	1,750	1·2	860	1·6	1,120	2·3	1,900	1·6	1,120	...17
2·9	3,020	2·2	1,750	1·2	860	1·4	970	3·2	3,650	1·6	1·120	...18
2·9	3,020	2·1	1.620	1·2	860	1·4	970	4·6	7·040	1·6	1,120	...19
2·9	3,020	2·0	1,500	1·2	860	1·3	910	3·6	4,570	1·55	1,080	...20
2·8	2,820	2·0	1,500	1·2	860	1·4	970	3·2	3,650	1·55	1,080	...21
2·8	2,820	1·9	1,390	1·2	860	1·4	970	3·2	3,650	1·55	1,080	...22
2·5	2·250	1·9	1,390	1·2	860	1·3	910	3·3	3,870	1·5	1,040	...23
2·4	2,070	1·8	1,290	1·2	860	1·3	910	3·1	3,430	1·5	1,040	...24
2·4	2,070	1·8	1,290	1·2	860	1·8	1,290	2·8	2,820	1·5	1,040	...25
2·4	2,070	1·8	1,290	1·1	810	1·8	1,290	2·6	2·440	1·5	1,040	...26
2·3	1,900	1·7	1,200	1·1	810	1·6	1,120	2·6	2,440	1·5	1,040	...27
2·2	1,750	1·7	1,200	1·0	770	1·5	1,040	2·5	2,250	1·5	1,040	...28
2·2	1,750	1·6	1,120	1·0	770	1·4	970	2·3	1,900	1·6	1,120	...29
2·1	1,620	1·6	1,120	1·0	770	1·4	970	2·25	1,825	1·6	1,120	...30
2·1	1,620	1·6	1,120	..		1·3	910	... ..	...	1·7	1,200	...31

MONTHLY DISCHARGE of Chilliwack River, Three Miles Above Mouth, for 1912.

(Drainage area, 450 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
January..	4,340	810	1,518	3·4	3·9	93,400	
February..	3,020	1,040	1,870	4·2	4·5	107,600	
March......	1,040	770	865	1·9	2·2	53,200	
April........	1,120	860	980	2·2	2·5	58,300	
May.........	8,800	1,120	4,581	10·2	11·8	281,600	
June.......	9,050	3,650	6,387	14·2	15·8	380,000	
July.......	5,330	1,620	3,089	6·9	7·9	190,000	
August....	2,070	1,120	1,386	3·1	3·6	852,000	
September	1,500	770	956	2·1	2·3	56,900	
October...	1,290	770	893	2·0	2·3	54,900	
November	7,040	860	2,347	5·2	5·8	139,000	
December	1,750	1,040	1,232	2·7	3·1	75,700	
The year.	9,050	770	2,175	4·8	65·7	2,342,600	85

NOTE.—Accuracy "A" up to 4,000 c.f.s. Accuracy "B" above 4,000 c.f.s.

COLUMBIA RIVER.

Columbia river rises in East Kootenay, British Columbia, in north latitude 50° 15', and west longitude 115° 50' at an elevation of 2,700 feet above mean sea-level. The river actually commences in Upper Columbia lake within 1½ miles of Kootenay river, from which it is separated only by Canal flat. This lake is about 8 miles long in a north and south direction, and from 1 to 2 miles wide. Thence the river flows almost due north for six miles and widens into lake Windermere, which is about the same size as the Upper lake. From lake Windermere the river flows in a northwest direction for 160 miles to the 'Big Bend,' in latitude 52° 02', longitude 118° 25'. It then turns abruptly southward and flows for 125 miles to the Arrow lakes. Soon it crosses the International boundary into the state of Washington, and empties into the Pacific.

Of the total length of 1,150 miles, some 465 are in British Columbia. The drainage area above the International boundary, and including Pend d'Oreille and Kootenay rivers, is about 60,000 square miles. The total drainage area is about 259,000 square miles.

Columbia river, in its course through British Columbia, may be conveniently divided for hydrographic purposes into five sections. First, from its source in Upper Columbia lake to the town of Golden, on the main line of the Canadian Pacific railway, a distance of some 90 miles. Second, from Golden to the "Big Bend," a distance of about 90 miles. Third, from the "Big Bend" to Upper Arrow lake, about 25 miles south of Revelstoke, on the C.P.R. Fourth, through the Arrow lakes to where the river is joined by its largest tributary, Kootenay river. And fifth, from the mouth of Kootenay river to the mouth of Pend d'Oreille river, near where the Columbia enters the state of Washington.

Extracts from Water Supply Paper No. 252, "The North Pacific Coast" (U.S. Geological Survey):—

"The total drainage area of the Columbia is estimated from the best available maps to be 259,000 square miles, divided as follows:—

Oregon	55,370	square	miles.
Washington	48,000	"	"
Idaho	81,380	"	"
Montana	25,000	"	"
Nevada	5,280	"	"
Wyoming	5,270	"	"
British Columbia	38,700	"	"

(Not including Pend d'Oreille river.)

"The area drained by the Columbia includes perhaps the largest consolidated area of forests in the world. Originally almost the entire area, except those arid portions midway between the mountain ranges, was covered with dense forests, and although the territory has been settled for about sixty-five years and large areas have been cleared, the percentage of forested area to the entire area has been reduced but slightly. It is believed that at least 45 per cent of the drainage area of Columbia river is forested.

"The rainfall is distributed over the area most irregularly. From the Pacific coast eastward to the summit of the Coast range the mean annual rainfall varies from 100 to 150 inches. In the basins between the Coast and Cascade ranges, it drops to about 40 inches per annum. It increases again to about 100 inches on the summit of the Cascade range, and decreases very rapidly to beyond the summit, until at the eastern base of the Cascades it has dropped to about 14 inches. At the mouth of Snake river the mean annual rainfall is about 9 inches, but this extremely low rainfall obtains only in the lower altitudes.

"The climate of the area exhibits all the variations from the rigorous climate of the northern latitudes, as found in British Columbia and the higher table-lands of Oregon and Idaho, to the mild climate of Western Oregon and Washington.

"As regards irrigation, the area ranges from the extremely arid region, where irrigation is absolutely essential, through the semi-arid country, where dry farming and irrigation are practised side by side, to the humid country that, strictly speaking, is arid in the summer months."

Columbia River (above Golden.)

Columbia river above Golden elevation 2,600 feet flows through an alluvial valley from one to two miles wide, lying between the Stanford, Brisco and Beaverfoot ranges of the Rockies on the east, and the Selkirk range on the west, its general direction being northwest. The river is navigable from Golden to lake Windermere for flat-bottom steamers, and meanders through the valley in tortuous channels and side channels, now close to the benches on the one side, then hugging the opposite shore. The direct distance from lake Windermere to Golden is increased by a dozen miles via the winding main channel of the river. The river is from 200 to 400 feet wide; it has a depth at low water of from 2 to 6 feet; the difference between low and high water level is from 6 to 12 feet. The velocity of the current varies from 2 feet per second (surface velocity) at low water, to 6·5 feet per second at high water. The river has an average gradient of one foot per mile.

During June, July and August, when the summer's sun melts the ice and snow on the glaciers and mountains, most of the tributaries of the Columbia become raging torrents, and the river itself soon floods nearly all the bottom lands of the valley to a depth ranging from 1 to 4 feet. At this time, viewing the valley from the vantage of a neighbouring mountain peak, it seems to be one vast lake in which the main channel of the river is distinguishable only by a fringe of cottonwood trees and willow lining the natural levees of its sandy banks. The numerous side-channels, sloughs and meadows are filled with water until about the end of August, when the river begins to lower rapidly, the water in the sloughs following suit more slowly, the recession in them taking place partly through small channels and partly by seepage. In the low places which are on the same level as the low-water mark of the river, water remains all the year round, these ponds being lined with rushes and wild grasses, where duck and geese abound. In the fall the farmers cut wild hay from the dry parts of the sloughs and meadows. A movement is now on foot to reclaim these overflow lands of the Columbia valley (some 50,000 acres in all) by straightening, dredging and dyking the river, and completely controlling the flood waters of the river and its tributaries. It was partly in connection with this possible reclamation that hydrographic studies were made during the summer of 1912 of the upper Columbia and its larger tributaries.

The lower bench lands of the upper Columbia valley are good agricultural lands, especially when irrigated, for which there is a good supply of water in the small streams coming from the high mountains. Several large tracts of land in the Windermere district are now being developed by irrigation companies.

Between Golden and lake Windermere a wagon road runs along the east side of the valley, and it is on this side that nearly all the settlement and farming have taken place. The Kootenay Central branch of the C.P.R., now under construction, will also follow the east side.

The Columbia River Lumber Co., which has large mills at Golden, uses the river extensively for log-driving. This company also operates several flat-bottom steamers on the river, carrying freight and passengers. During the latter part of the season, however, navigation is difficult owing to sandbars and general shallowness.

Most of the tributaries from the east are very small, due to the small drainage of the mountain ranges on that side. On the west, the streams rise in the lofty snowy Selkirks. Dutch creek, Toby creek, Horsethief creek, No. 2 creek, Bugaboo river and Spillimacheen river are all good-sized streams, the latter having an average flood discharge of from 5,000 to 7,000 cubic feet per second.

The Columbia freezes about the middle of November each year and does not break until early in April. The winters are severe, the thermometer sometimes registering —50° F. The snow fall in the valley is about 4 feet. The mean annual precipitation is from 8 inches (near lake Windermere) to 21 inches (near Golden).

On the Selkirk side of the drainage area the precipitation is much greater, being probably 40 inches to 80 inches mostly snowfall. The summers are hot (maximum 90° F.) but the nights are cool (40° F.).

Hydrographic studies were carried on during 1912 at the following stations on the upper Columbia and its tributaries: Columbia river (at Athalmere), Columbia river (at Spillimacheen), Columbia river (at Golden), Toby creek, Horsethief creek, No. 2 creek, Bugaboo river, and Spillimacheen river, besides miscellaneous measurements made at many of the smaller tributaries.

For the detailed hydrographic data of stream flow, see the individual stations and streams.

COLUMBIA RIVER, AT GOLDEN (402).

The station was established October 17, 1911, by C. E. Richardson. The measuring section is located 200 yeards below the Columbia River Lumber Co. mill and half mile above the mouth of Kicking Horse river. A boom runs across 100 yards above the section, and there is a riffle below the section. At high water this section was abandoned and one chosen just below the gauge. Measurements were made by means of an eighth-inch cable stretched across the river, and the measuring done from a boat every ten feet. The channel above the measuring section at low water is straight for over 1,000 feet. The water is uniform in current, being moderately swift near the bank, and slower near the right bank. The channel below the measuring section at low water is straight for over 500 feet. The right bank is low, and lined with some trees. At low water the river uncovers a sandbar along the right bank. At very high water in June and July the right bank overflows. The left bank is steep and lined with timber. It is not liable to overflow. The bed of the stream near the centre and the left bank is gravelly, but near the gauge it is muddy with soggy sawdust. The current is slow near the right bank, and there is not much probability of shifting channel except at very high water. Some silt is borne down by the flood waters of the summer floods, but this should not alter the channel perceptibly. Only one channel, about 400 feet wide at high water, and only 200 feet at low water. The depth in the deepest place at low water is 6 feet, and the river rises from 10 to 12 feet at the flood.

The measurements at this station should be good. There is no probability of back water from Kicking Horse river, or altered conditions at different seasons. The river freezes in November, and does not break up till April 1. Gauge readings during the frozen period will not be of much use, as the gauge is in a very shallow place, where the ice and mud prevent the gauge from registering any fluctuations in the flow under ice cover.

The gauge is a vertical staff, 2 inches by 4 inches by 12 feet (cedar), marked in feet and inches, replacing a similar gauge set by the lumber company many years ago. Zero is at the top, and represents the high-water mark of 1894. The gauge reads down to 12 feet. It is fastened to an 18-inch pile opposite the mill, near the right bank. Within a few feet of the lumber company gauge, a new gauge has recently (summer of 1912) been set. This gauge is divided in feet and tenths, with the zero at the bottom as in hydrographic survey gauges. It might be advisable to transfer to the new gauge, for convenience. All readings from 1903 to October, 1912, are on old gauge, *i.e.*, in feet and inches, and readings from the top. Instead of depending on the lumber company's storekeeper (who reads their gauge until October each year) we secured a new gauge reader to read the second gauge (here described) three times per week until freeze-up.

The following bench-marks were established, and referred to the zero of the gauge No. 1:—

B.M. No. 1.—Bench-mark in head of 3-inch nail on pile on lower side of log-way near the right bank of river. Elevation. 7'·25.

B.M. No. 2.—Bench-mark is head of 3-inch nail in base rail of north-west corner of mill building. Elevation 1'·20.

B.M. No. 3.—Head of 5-inch spike in base of trestle on horizontal beam of log-way of mill, on lower side. Elevation, 1'·15.

Gauge No. 1 is the lumber company gauge, reading (with zero at high-water mark of 1894) downward.

Gauge No. 2 is new gauge within a few feet of gauge No. 1, with the zero at the bottom and reading up.

To connect the two gauges the following simultaneous readings were taken:—

July 28, 1912.—Gauge No. 1.=5′ 7·9″. Gauge No. 2=7′ ·00″.

October 1, 1912.—Gauge No. 1.=10′ ·6″. Gauge No. 2=2′ ·12″.

Or, the zero of gauge No. 2 is 0·64 feet below the 12-foot mark on gauge No. 1, or is 12·64 feet below the zero of gauge No. 1.

Note that all elevations of bench-marks are negative, *i.e.*, are below the zero of the gauge, which is at the top of the gauge.

DISCHARGE MEASUREMENTS of Columbia River, at Golden (402), for 1911-12.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Oct. 17	C. E. Richardson	1048	176	792	2·3	10·75	1,870
1912.							
Feb. 20	"	1048	175	615	1·3	..	795*
June 4	H. C. Hughes	1055	200	1,026	3·0	9·17	3,100
June 8	"	1055	218	1,275	3·5	8·05	4·490
June 24	"	1055	430	2,485	4·3	5·05	9·700
July 4	"	1055	385	1,915	4·6	5·36	8,800
July 28	"	1055	375	2,000	4·1	5·64	8·300
Oct. 1	C. E. Richardson	1055	180	798	2·5	10·50	2,020

NOTE.—The discharge curve was projected up to gauge height 0·0 by means of area and velocity curves, and the flood discharge of the year 1894 estimated very closely.

*Ice-cover.

DAILY GAUGE HEIGHT AND DISCHARGE

Day	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	10·5	2,050	6·8	6,300	12·8	15,300
2	....	....	10·5	2,050	5·9	7,900	3·2	14,200
3	....	....	10·3	2,150	5·2	9,300	3·5	13,300
4	....	....	10·5	2,050	4·7	10,400	3·7	12,800
5	....	....	10·4	2,100	4·4	11,000	3·8	12,500
6	....	....	10·2	2,200	4·3	11,300	4·1	11,800
7	....	....	10·0	2,350	4·1	11,800	4·3	11,300
8	....	....	9·9	2,450	3·9	12,300	4·4	11,000
9	....	....	9·7	2,600	3·7	12,800	4·6	10,600
10	....	....	9·8	2,500	3·5	13,300	4·6	10,600
11	....	....	9·8	2,500	3·3	13,900	4·7	10,400
12	....	....	9·8	2,500	3·0	14,800	4·7	10,400
13	....	....	9·8	2,500	2·7	15,600	4·7	10,400
14	....	....	9·5	2,800	2·2	17,100	4·8	10,200
15	....	....	8·8	3,500	1·9	18,100	4·8	10,200
16	11·2	1,650	8·4	4,000	1·6	19,100	4·8	10,200
17	11·1	1,700	8·4	4,000	1·3	20,100	4·8	10,200
18	11·0	1,750	8·4	4,000	1·2	20,500	4·8	10,200
19	11·0	1·750	8·6	3·750	1·1	20·800	4·8	10,200
20	10·9	1,800	8·8	3,500	1·1	20,800	4·9	9,900
21	10·8	1,850	8·8	3,500	1·2	20,500	5·0	9,700
22	10·8	1,850	8·9	3,400	1·5	19,400	5·1	9,500
23	10·7	1,900	9·1	3,150	1·7	18,800	5·1	9,500
24	10·7	1,900	9·1	3,150	2·0	17,800	5·0	9,700
25	10·6	1,950	9·1	3,150	2·2	17,100	5·0	9,700
26	10·5	2,050	8·9	3,400	2·4	16,500	4·9	9,900
27	10·3	2,150	8·6	3,750	2·6	15,900	4·6	10,600
28	10·2	2,200	8·2	4,250	2·6	15,900	4·6	10,600
29	10·2	2,200	7·8	4,800	2·7	15,600	4·6	10,600
30	10·3	2,150	7·7	4,900	2·8	15,300	4·6	10,600
31	....	....	7·4	5,400	....	....	4·6	10,600

of Columbia River, at Golden, for 1903.

Day.	August.		September.		October.		November.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·6	10,600	6·1	7,500	6·6	6·700	9·4	2,900
2	4·6	10,600	6·3	7,200	6·7	6,500	9·4	2,900
3	4·6	10,600	6·6	6,700	6·9	6,100	9·5	2,800
4	4·6	10,600	6·7	6,500	7·3	5,500	9·5	2,800
5	4·6	10,600	6·8	6,300	7·7	4,800	9·5	2,800
6	4·7	10,400	7·0	6,000	8·0	4,500	9·6	2,700
7	4·9	9,900	7·1	5,800	8·2	4,250	9·6	2,700
8	4·9	9,900	7·4	5,400	8·3	4,100	9·6	2,700
9	4·9	9,900	7·7	4,900	8·6	3,750	9·6	2,700
10	5·0	9,700	7·9	4,650	8·7	3,650	9·6	2,700
11	5·0	9,700	8·0	4,500	8·7	3,650	9·6	2,700
12	5·0	9,700	8·3	4,100	8·7	3,650	9·6	2,700
13	5·0	9,700	8·5	3,900	8·8	3,500	9·6	2,700
14	5·1	9,500	8·6	3,750	8·8	3,500	9·6	2,700
15	5·1	9,500	8·6	3,750	8·9	3,400	9·7	2,600
16	5·1	9,500	8·7	3,650	8·9	3,400	9·7	2,600
17	5·2	9,300	8·8	3,500	8·9	3,400	9·7	2,600
18	5·2	9,300	8·8	3,060	9·0	3,300	9·7	2,600
19	5·2	9,300	9·0	3,300	9·2	3,050	9·7	2,600
20	5·2	9,300	[illegible]·1	3,150	9·2	3,050	9·7	2,600
21	5·3	9,100	9·2	3,050	9·2	3,050	9·7	2,600
22	5·3	9,100	9·4	2,900	9·2	3,050	9·8	2,500
23	5·3	9,100	9·4	2,900	9·2	3,050	9·8	2,500
24	5·3	9,100	9·3	3,000	9·1	3,150	....	....
25	5·4	8,900	7·5	5,200	9·1	3,150	....	....
26	5·4	8,900	7·0	6,000	9·0	5,300	....	....
27	5·5	8,700	6·7	6,500	9·1	3,150	....	....
28	5·7	8,300	6·5	6,800	9·2	3,050	....	....
29	5·8	8,100	6·5	6,800	9·2	3,050	....	....
30	5·8	8,100	6·5	6,800	9·3	3,000	....	....
31	5·9	7,900			9·3	3,000	....	....

MONTHLY DISCHARGE of Columbia River at Golden, for 1903.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	2,200	1,650	1,800	0·72	0·8	107,000
May	5,400	2,050	3,174	1·27	1·5	195,000
June	20,800	6,300	15,330	6·13	6·8	910,000
July	15,300	9,500	10,860	4·34	5·0	664,000
August	10,600	7,900	9,448	3·78	4·4	581,000
September..................	7,500	2,900	4,933	1·97	2·2	293,000
October	6,700	3,000	3,800	1·52	1·7	233,000
November..................	2,900	2,500	2,600	1·04	1·2	155,000

NOTE.—The year 1903 was one of large flood, although by no means as great as 1894. Maximum discharge, 1894, was 24,600 c.f.s.

Gauge read only during the open season. Accuracy, "A" up to 12,000 c.f.s. Accuracy "B" over 12,000 c.f.s. The winter flow varies from 800 to 1,200, reaching its minimum about the end of February.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....		8·0	4,500	7·3	5,500	4·4	11,000
2	...		8·0	4,500	7·2	5,700	4·2	11,600
3	.....		8·1	4,400	7·0	6,000	4·0	12,000
4	.....		8·2	4,250	6·7	6,500	3·7	12,800
5	....		8·3	4,100	6·2	7,300	3·5	13,300
6	....		8·3	4,100	6·1	7,500	3·2	14,200
7	....		8·5	3,900	5·7	8,300	2·8	15,300
8	....		8·7	3,650	5·6	8,500	2·4	16,500
9	....		9·0	3,300	5·5	8,700	2·2	17,100
10	....		9·0	3,300	5·4	8,900	2·0	17,800
11	.....		9·1	3,150	5·4	8,900	·9	18,100
12	.....		9·2	3,050	5·5	8,700	2·0	17,800
13	10·6	1,950	9·3	3·000	5·6	8,500	2·0	17,800
14	10·2	2,200	9·2	3,050	5·8	8,100	2·1	17,500
15	9·8	2,500	9·2	3,050	5·8	8,100	2·4	16,500
16	9·6	2,700	9·1	3,150	5·8	8,100	2·7	15,600
17	9·7	2,600	9·0	3,300	5·3	9,100	3·0	14,800
18	9·8	2,500	8·7	3,650	5·1	9,500	3·4	13,600
19	9·7	2,600	8·7	3,650	4·7	10,400	3·7	12,800
20	9·6	2,700	8·0	4,500	4·5	10,800	3·9	12,300
21	9·4	2,900	7·5	5,200	4·4	11,000	4·2	11,600
22	9·1	3·150	7·1	5,800	4·4	11,000	4·5	10,800
23	9·1	3,150	6·7	6,500	4·2	11,600	4·7	10,400
24	8·7	3,650	6·6	6,700	4·3	11,300	4·8	10,200
25	8·7	3,650	6·4	7,000	4·4	11,000	5·0	9,700
26	8·8	3,500	6·5	6,800	4·5	10,800	5·1	9,500
27	8·7	3,650	6·8	6,300	4·6	10,600	5·1	9,500
28	8·5	3,900	7·0	6,000	4·7	10,400	5·1	9,500
29	8·2	4,250	7·2	5,700	4·7	10,400	5·1	9,500
30	8·0	4,500	7·4	5,400	4·7	10,400	5·1	9,500
31	...		7·4	5,400	...		5·1	9,500

of Columbia River, at Golden, for 1904.

August.		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
5·1	9,500	7·4	5,400	9·5	2,800	11·2	1,650	1
5·2	9,300	7·3	5,500	9·5	2,800	11·2	1,650	2
5·2	9,300	7·3	5,500	9·5	2,800	11·2	1,650	3
5·3	9,100	7·2	5,700	9·3	3,000	11·2	1,650	4
5·4	8,900	7·1	5,800	9·4	2,900	11·2	1,650	5
5·4	8,900	7·1	5,800	9·7	2,600	11·2	1,650	6
5·4	8,900	7·1	5,800	10·0	2,350	11·2	1,650	7
5·4	8,900	7·0	6,000	10·2	2,200	11·2	1,650	8
5·4	8,900	7·1	5,800	10·3	2,150	11·2	1,650	9
5·4	8,900	7·1	5,800	10·4	2,100	11·3	1,625	10
5·4	8,900	7·2	5,700	10·5	2,050	11·3	1,625	11
5·4	8,900	7·3	5,500	10·5	2,050	11·3	1,625	12
5·3	9,100	7·7	4,[illegible]00	10·5	2,050	11·3	1,625	13
5·4	8,900	7·8	4,800	10·5	2,050	11·3	1,625	14
5·4	8,900	8·0	4,500	10·6	1,950	11·3	1,625	15
5·4	8,900	8·2	4,250	10·6	1,950	11·3	1,625	16
5·5	8,700	8·3	4,100	10·6	1,950	11·2	1,650	17
5·5	8,700	8·6	3,750	10·7	1,900	11·2	1,650	18
5·5	8,700	8·9	3,400	10·7	1,900	11·2	1,650	19
5·5	8,700	9·2	3,050	10·7	1,900	11·2	1,650	20
5·7	8,300	9·3	3,000	10·8	1,850	11·2	1,650	21
6·0	7,700	9·5	2,800	10·9	1,800	11·2	1,650	22
6·3	7,200	9·8	2,500	10·9	1,800	11·3	1,625	23
6·8	6,300	9·8	2,500	11·0	1,750	11·3	1,625	24
7·0	6,000	9·7	2,600	11·0	1,750			25
7·2	5,700	9·8	2,500	11·1	1,700			26
7·5	5,200	9·9	2,450	11·1	1,700			27
7·5	5,200	9·6	2,700	11·2	1,650			28
7·4	5,400	9·5	2,800	11·2	1,650			29
7·4	5,400	9·5	2,800	11·2	1,650			30
7·4	5,400			11·2	1,650			31

MONTHLY DISCHARGE of Columbia River at Golden, for 1904.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	4,500	1,950	3,000	1·20	1·34	178,500
May	7,000	3,000	4,527	1·81	2·1	278,500
June	11,600	5,500	9,053	3·62	4·0	538,500
July	18,100	9,500	13,164	5·27	6·1	805,500
August	9,500	5,200	7,961	3·18	3·7	489,400
September	6,000	2,500	4,256	1·7	1·9	253,500
October	3,000	1,650	2,077	0·83	1·0	127,300
November	1,650	1,625	1,625	0·65	0·7	96,400

NOTE.—Accuracy "A" up to 12,000 c.f.s.; "B" over 12,000 c.f.s.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	March.		April.		May.		June.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			11·8	1,400	10·3	2,150	7·5	5,200
2			11·8	1,400	10·4	2,100	6·9	6,100
3			11·7	1,450	10·5	2,050	6·4	7,000
4			11·7	1,450	10·5	2,050	5·9	7,900
5			11·7	1,450	10·7	1,900	5·7	8,300
6			11·7	1,450	10·7	1,900	5·5	8,700
7			11·7	1,450	10·5	2,050	5·2	9,300
8			11·7	1,450	10·4	2,100	5·0	9,700
9			11·7	1,450	9·8	2,500	4·8	10,2[illegible]
10			11·6	1,500	9·5	2,800	4·7	10,[illegible]
11			11·7	1,450	9·2	3,050	4·6	[illegible]
12			11·7	1,450	9·0	3,300	4·5	[illegible]
13			11·7	1,450	9·2	3,050	4·5	[illegible]
14			11·7	1,450	9·3	3,000	4·5	[illegible]
15			11·8	1,400	9·4	2,900	4·5	[illegible]
16			11·8	1,400	9·5	2,800	4·5	[illegible]
17			11·9	1,350	9·6	2,700	4·5	[illegible]
18			11·9	1,350	9·3	3,000	4·6	[illegible]
19			11·9	1,350	8·8	3,500	4·8	10,200
20			11·9	1,350	8·5	3,900	5·0	9,700
21	11·3	1,625	11·8	1,400	8·4	4,000	5·2	9,300
22	11·3	1,625	11·8	1,400	8·2	4,250	5·2	9,300
23	11·4	1,575	11·6	1,500	8·1	4,400	5·5	8,700
24	11·4	1,575	11·0	1,750	8·2	4,250	5·6	8,500
25	11·4	1,575	11·0	1,750	8·2	4,250	5·6	8,500
26	11·5	1,550	10·8	1,850	8·4	4,000	5·7	8,300
27	11·6	1,500	10·0	2,350	8·3	4,100	5·8	8,100
28	11·7	1,450	9·8	2,500	8·3	4,100	5·9	7,900
29	11·7	1,450	9·8	2,500	8·2	4,250	6·1	7,500
30	11·8	1,400	10·0	2,350	8·1	4,400	6·2	7,300
31	11·8	1,400			7·8	4,800		

of Columbia River, at Golden, for 1905.

July.		August.		September.		October.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
6·1	7,500	4·6	10,600	7·5	5,200	9·2	3,050	1
6·1	7,500	4·6	10,600	7·5	5,200	9·3	3,000	2
6·0	7,700	4·6	10,600	7·6	5,000	9·6	2,700	3
[illegible]	7,900	4·6	10,600	7·7	4,900	9·5	2,800	4
[illegible]	8,300	4·7	10,400	7·8	4,800	9·4	2,900	5
[illegible]	8,500	4·7	10,400	8·1	4,400	9·3	3,000	6
[illegible]	8,900	4·7	10,400	8·4	4,000	9·2	3,050	7
[illegible]	9,300	4·7	10,400	8·2	4,250	9·3	3,000	8
[illegible]	9,500	4·7	10,400	8·1	4,400	9·3	3,000	9
[illegible]	9,700	4·7	10,400	8·0	4,500	9·5	2,800	10
[illegible]	9,900	4·6	10,600	7·9	4,650	9·5	2,800	11
[illegible]	10,200	4·7	10,400	7·9	4,650	10·1	2,300	12
[illegible]	10,400	4·7	10,400	7·9	4,650	10·1	2,300	13
[illegible]	10,600	4·8	10,200	8·2	4,250	10·1	2,300	14
[illegible]	10,400	4·7	10,400	8·3	4,100	10·2	2,200	15
[illegible]	10,400	4·8	10,200	8·6	3,750	10·3	2,150	16
[illegible]	10,200	4·8	10,200	9·0	3,300	10·4	2,100	17
[illegible]	10,200	5·0	9,700	9·2	3,050	10·5	2,050	18
[illegible]	9,700	5·3	9,100	9·2	3,050	10·6	1,950	19
5·0	9,700	5·8	8,100	9·2	3,050	....		20
[illegible]	9,500	6·2	7,300	9·2	3,050	...	...	21
[illegible]	9,500	6·3	7,200	8·9	3,400	...	...	22
5·1	9,500	6·4	7,000	8·7	3,650	...	...	23
5·1	9,500	6·5	6,800	8·5	3,900	...	...	24
5·0	9,700	7·0	6,000	8·3	4,100	...	...	25
4·9	9,900	7·2	5,700	8·3	4,100	...	...	26
4·8	10,200	7·2	5,700	8·2	4,250	...	...	27
4·7	10,400	7·3	5,500	8·4	4,000	...	...	28
4·7	10,400	7·4	5,400	8·7	3,650	...	...	29
4·6	10,600	7·6	5,000	9·2	3,050	...	...	30
4·6	10,600	7·5	5,200	..	..	...	...	31

Monthly Discharge of Columbia River, at Golden, for 1906.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	1,625	1,200	1,500	0·6	0·7	92,200
April	2,500	1,350	1,593	0·64	0·7	94,800
May	4,800	1,900	3,212	1·28	1·5	197,400
June	10,800	5,200	9,070	3·63	4·1	539,700
July	10,600	7,500	9,558	3·82	4·4	587,800
August	10,600	5,000	8,738	3·5	4·0	537,400
September	5,200	3,050	4,076	1·63	1·8	242,800
October	3,050	1,950	2,000	0·8	0·9	123,000

Note.—Accuracy "A" up to 12,000 c.f.s.; "B" over 12,000 c.f.s.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	11·0	1,750	9·3	3,000	8·2	4,250	5·6	8,500
2	11·2	1,650	8·9	3,400	8·3	4,100	5·4	8,900
3	11·2	1,650	8·6	3,750	8·1	4,400	5·3	9,100
4	11·3	1,625	8·5	3,900	7·8	4,800	5·2	9,300
5	11·4	1,575	8·5	3,900	7·3	5,500	5·1	9,500
6	11·4	1,575	8·8	3,500	7·0	6,000	5·0	9,700
7	11·3	1,625	9·1	3,150	6·8	6,300	4·7	10,400
8	11·2	1,650	9·2	3,050	6·7	6,500	4·5	10,800
9	11·1	1,700	9·3	3,000	7·0	6,000	4·3	11,300
10	11·2	1,650	9·3	3,000	7·1	5,800	4·2	11,600
11	11·2	1,650	8·8	3,500	7·2	5,700	4·0	12,000
12	11·3	1,625	8·0	4,500	7·3	5,500	3·7	12,800
13	11·3	1,625	7·2	5,700	7·0	6,000	3·5	13,300
14	11·3	1,625	7·0	6,000	6·7	6,500	3·3	13,900
15	11·3	1,625	6·7	6,500	6·5	6,800	3·3	13,900
16	11·3	1,625	6·7	6,500	6·4	7,000	3·3	13,900
17	11·2	1,650	6·7	6,500	6·5	6,800	3·4	13,600
18	11·0	1,750	6·8	6,300	6·7	6,500	3·5	13,300
19	10·8	1,850	7·2	5,700	6·9	6,100	3·7	12,800
20	10·8	1,850	7·6	5,000	7·2	5,700	3·8	12,500
21	10·8	1,850	7·8	4,800	7·5	5,200	3·8	12,500
22	10·5	2,050	7·9	4,650	7·7	4,900	4·0	12,000
23	10·0	2,350	8·0	1,500	7·7	4,900	4·0	12,000
24	9·4	2,900	8·0	4,500	7·8	4,800	4·1	11,800
25	9·2	3,050	8·1	4,400	7·7	4,900	4·2	11,600
26	9·2	3,050	8·2	4,250	7·2	5,700	4·2	11,600
27	9·5	2,800	8·2	4,250	6·7	6,500	4·2	11,600
28	9·7	2,600	8·1	4,400	6·2	7,300	4·3	11,300
29	9·7	2,600	8·1	4,400	5·8	8,100	4·3	11,300
30	9·7	2,600	8·2	4,250	5·7	8,300	4·3	11,300
31		...	8·2	4,250			4·4	11,000

of Columbia River, at Golden, for 1906.

August.		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
4·5	10,800	7·1	5,800	9·7	2,600	10·6	1,950	1
4·6	10,600	7·0	6,000	9·8	2,500	10·8	1,850	2
4·8	10,200	6·8	6,300	9·5	2,800	10·9	1,800	3
5·0	9,700	6·8	6,300	9·3	3,000	11·0	1,750	4
5·2	9,300	7·1	5,800	9·7	2,600	11·0	1,750	5
5·3	9,100	7·2	5,700	9·8	2,500	11·1	1,700	6
5·6	8,500	7·2	5,700	9·8	2,500	11·1	1,700	7
5·7	8,300	7·0	6,000	9·8	2,500	11·2	1,650	8
5·8	8,100	6·7	6,500	9·6	2,700	11·3	1,625	9
5·8	8,100	6·1	7,500	9·3	3,000	11·3	1,625	10
5·7	8,300	6·0	7,700	9·4	2,900	11·3	1,625	11
5·6	8,500	6·1	7,500	9·3	3,000	10·9	1,800	12
5·5	8,700	6·3	7,200	9·3	3,000	10·7	1,900	13
5·3	9,100	7·0	6,000	9·3	3,000	10·7	1,900	14
5·3	9,100	7·7	4,900	9·6	2,700	10·6	1,950	15
5·3	9,100	8·3	4,100	9·8	2,500	10·7	1,900	16
5·3	9,100	8·9	3,400	9·9	2,450	10·8	1,850	17
5·3	9,100	9·1	3,150	10·1	2,300			18
5·4	8,900	8·7	3,650	10·2	2,200			19
5·6	8,500	8·3	4,100	10·3	2,150			20
5·8	8,100	8·1	4,400	10·4	2,100			21
6·1	7,500	8·0	4,500	10·6	1,950			22
6·4	7,000	8·0	4,500	10·7	1,900			23
6·8	6,300	8·1	4,400	10·8	1,850			24
7·0	6,000	8·2	4,250	10·8	1,850			25
7·3	5,500	8·3	4,100	10·4	2,100			26
7·5	5,200	8·8	3,500	10·3	2,150			27
7·5	5,200	9·3	3,900	10·2	2,200			28
7·7	4,900	9·5	2,800	10·0	2,350			29
7·5	5,200	9·6	2,700	10·3	2,150			30
7·3	5,500			10·5	2,050			31

DISCHARGE of Columbia River, at Golden, for 1906.

(Discharge area, 2,500 square miles).

Month.	Discharge in Second Feet.				Run-Off.	
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	3,050	1,575	1,972	0·79	0·9	117,200
May	6,500	3,000	4,168	1·79	2·1	274,800
June	8,300	4,100	5,895	2·36	2·6	350,500
July	13,900	8,500	11,584	4·63	5·3	713,300
August	10,800	4,900	7,983	3·19	3·7	490,700
September	7,700	2,700	5,048	2·0	2·2	300,500
October	3,000	1,850	2,437	0·97	1·1	150,000
November	1,950	1,625	1,700	0·68	0·8	101,100

NOTE.—Accuracy "A" up to 12,000 c.f.s., "B" over 12,000 c.f.s.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	April		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			11·3	1,625	6·6	6,700	3·5	13,300
2			11·3	1,625	6·2	7,300	3·1	14,500
3			11·3	1,625	6·0	7,700	3·0	14,800
4			11·2	1,650	5·9	7,900	2·9	15,100
5			11·1	1,700	5·7	8,300	2·9	15,100
6			11·0	1,750	5·7	8,300	2·9	15,100
7	11·5	1,550	10·9	1,800	5·6	8,500	3·0	14,800
8	11·4	1,575	10·7	1,900	5·5	8,700	3·2	14,200
9	11·4	1,575	10·3	2,150	5·4	8,900	3·3	13,900
10	11·3	1,625	9·8	2,500	5·4	8,900	3·5	13,300
11	11·2	1,650	9·3	3,000	5·4	8,900	3·6	13,100
12	11·2	1,650	9·1	3,150	5·4	8,900	3·7	12,800
13	11·3	1,625	9·0	3,300	5·3	9,100	3·7	12,800
14	11·2	1,650	9·1	3,150	5·3	9,100	3·8	12,500
15	11·1	1,700	9·2	3,050	5·4	8,900	3·8	12,500
16	11·1	1,700	8·7	3,650	5·5	8,700	3·8	12,500
17	11·0	1,750	8·0	4,500	5·5	8,700	3·9	12,300
18	11·2	1,650	7·4	5,400	5·6	8,500	4·0	12,000
19	11·2	1,650	7·2	5,700	5·5	8,700	4·1	11,800
20	11·2	1,650	6·9	6·100	5·4	8,900	4·1	11,800
21	11·2	1,650	6·7	6,500	5·3	9,100	4·2	11,600
22	11·2	1,650	6·5	6,800	5·2	9,300	4·2	11,600
23	11·1	1,700	6·5	6,800	5·1	9,500	4·2	11,600
24	11·0	1,750	6·6	6,700	5·0	9,700	4·2	11,600
25	10·9	1,800	6·8	6,300	4·8	10,200	4·2	11,600
26	11·0	1,750	7·2	5,700	4·5	10,800	4·2	11,600
27	11·2	1,750	7·5	5,200	4·3	11,300	4·2	11,600
28	11·3	1,625	7·6	5,000	4·1	11,800	4·2	11,600
29	11·3	1,625	7·6	5,000	4·0	12,000	4·2	11,600
30	11·3	1,625	7·3	5,500	3·7	12,800	4·2	11,600
31			7·0	6,000			4·2	11,600

of Columbia River, at Golden, for 1907.

August.		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
4·1	11,800	6·1	7,500	9·5	2,800	10·3	2,150	1
4·1	11,800	6·2	7,300	9·7	2,600	10·5	2,050	2
4·1	11,800	6·3	7,200	9·6	2,700	10·7	1,900	3
4·1	11,800	6·5	6,800	9·4	2,900	10·7	1,900	4
4·0	12,000	6·6	6,700	9·6	2,700	10·8	1,850	5
4·1	11,800	6·7	6,500	9·7	2,600	10·8	1,850	6
4·1	11,800	6·8	6,300	9·8	2,500	10·9	1,800	7
4·2	11,600	7·0	6,000	9·8	2,500	11·0	1,750	8
4·2	11,600	7·0	6,000	9·9	2,150	11·0	1,750	9
4·4	11,000	7·1	5,800	9·9	2,150	11·1	1,700	10
4·7	10,400	7·1	5,800	9·7	2,600	11·1	1,700	11
4·9	9,900	7·1	5,800	9·7	2,600	11·1	1,700	12
5·2	9,300	7·2	5,700	9·7	2,600	11·1	1,700	13
5·4	8,900	7·2	5,700	9·5	2,800	11·2	1,650	14
5·6	8,500	7·4	5,400	9·5	2,800	11·2	1,650	15
5·8	8,100	7·6	5,000	9·6	2,700	11·3	1,625	16
6·0	7,700	7·8	4,800	9·6	2,700	11·3	1,625	17
6·1	7,500	8·0	4,500	9·1	2,900	11·3	1,625	18
6·2	7,300	8·2	4,250	9·3	3,000	11·3	1,625	19
6·2	7,300	8·3	4,100	9·5	2,800	10·9	1,800	20
6·4	7,000	8·5	3,900	9·7	2,600	10·5	2,050	21
6·6	6,700	8·7	3,650	9·9	2,450	10·7	1,900	22
6·6	6,700	8·7	3,650	10·1	2,300	10·8	1,850	23
6·6	6·700	8·7	3,650	10·3	2,150	10·8	1,850	24
6·5	6·800	8·8	3,500	10·4	2,100	10·9	1,800	25
6·4	7,000	8·9	3,400	10·4	2,100	11·1	1,700	26
6·3	7,200	8·9	3,400	10·5	2,050			27
6·1	7,500	9·1	3,150	10·5	2,050		...	28
5·9	7,900	9·3	3,000	10·5	2,050		...	29
5·9	7,900	9·4	2,900	10·3	2,150			30
6·0	7,700			10·2	2,200			31

MONTHLY DISCHARGE of Columbia River, at Golden, 1907.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	1,800	1,550	1,600	0·64	0·7	95,200
May	6,800	1,625	4,027	1·61	1·9	247,800
June	12,800	6,700	9,536	3·81	4·2	567,700
July	15,100	11,600	12,767	5·1	5·9	787,000
August	12,000	6,700	9,064	3·63	4·2	557,000
September	7,500	2,900	5,045	2·02	2·3	300,000
October	3,000	2,050	2,513	1·01	1·1	154,300
November	2,150	1,625	1,700	0·68	0·8	101,100

NOTE. Accuracy "A" up to 12,000 c.f.s. "B" over 12,000 c.f.s.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			9·9	2,450	6·5	6,800	4·0	12,000
2			9·7	2,600	6·5	6,800	4·0	12,000
3			9·4	2,900	6·3	7,200	3·9	12,300
4			9·0	3,300	6·1	7,500	3·9	12,300
5			8·7	3,650	5·9	7,900	3·8	12,500
6	11·4	1,575	8·5	3,900	5·5	8,700	3·8	12,500
7	11·4	1,575	8·2	4,250	5·2	9,300	3·7	12,800
8	11·3	1,625	8·0	4,500	4·9	9,900	3·7	12,800
9	11·2	1,650	7·5	5,200	4·7	10,400	3·6	13,100
10	11·2	1,650	7·2	5,700	4·5	10,800	3·5	13,300
11	11·2	1,650	7·1	5,800	4·3	11,300	3·3	13,900
12	11·2	1,650	7·0	6,000	4·1	11,800	3·0	14,800
13	11·1	1,700	7·0	6,000	4·0	12,000	2·8	15,300
14	11·1	1,700	6·7	6,500	3·8	12,500	2·5	16,200
15	11·0	1,750	6·6	6,700	3·6	13,100	2·2	17,100
16	11·0	1,750	6·5	6,800	3·3	13,900	2·0	17,800
17	11·0	1,750	6·3	7,200	3·3	13,900	1·8	18,500
18	10·8	1,850	6·4	7,000	3·3	13,900	1·8	18,500
19	10·7	1,900	6·6	6,700	3·3	13,900	2·0	17,800
20	10·4	2,100	6·7	6,500	3·3	13,900	2·1	17,500
21	10·1	2,300	6·8	6,300	3·5	13,300	2·3	16,800
22	9·7	2,600	7·0	6,000	3·6	13,100	2·3	16,800
23	9·5	2,800	7·1	5,800	3·7	12,800	2·4	16,500
24	9·5	2,800	7·3	5,500	3·7	12,800	2·5	16,200
25	9·5	2,800	7·3	5,500	4·0	12,000	2·5	16,200
26	9·5	2,800	7·1	5,800	4·0	12,000	2·7	15,600
27	9·7	2,600	7·1	5,800	4·0	12,000	2·8	15,300
28	9·8	2,500	6·8	6,300	3·9	12,300	2·9	15,100
29	9·8	2,500	6·7	6,500	4·0	12,000	3·2	14,200
30	9·8	2,500	6·6	6,700	4·1	11,800	3·5	13,300
31			6·5	6,800		......	3·8	12,500

of Columbia River, at Golden, for 1908.

August.		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
3·9	12,300	7·9	4,650	10·1	2,300	10·9	1,800	1
4·2	11,600	8·5	3,900	10·2	2,200	10·9	1,800	2
4·4	11,000	8·6	3,750	10·0	2,350	10·8	1,850	3
4·7	10,400	8·4	4,000	10·1	2,300	10·6	1,950	4
4·9	9,900	8·3	4,100	10·2	2,200	10·5	2,050	5
5·0	9,700	8·3	4,100	10·3	2,150	10·5	2,050	6
5·1	9,500	8·3	4,100	10·3	2,150	10·5	2,050	7
5·2	9,300	8·2	4,250	10·4	2,100	10·6	1,950	8
5·3	9,100	8·2	4,250	10·5	2,050	10·7	1,900	9
5·3	9,100	8·2	4,250	10·5	2,050	10·8	1,850	10
5·3	9,100	8·2	4,250	10·5	2,050	11·0	1,750	11
5·4	8,900	8·3	4,100	10·5	2,050	11·3	1,625	12
5·4	8,900	8·3	4,100	10·6	1,950	11·6	1,500	13
5·3	9,100	8·3	4,100	10·5	2,050			14
5·5	8,700	8·0	4,500	10·4	2,100			15
5·5	8,700	7·7	4,900	10·5	2,050			16
5·7	8,300	7·5	5,200	10·6	1,950			17
5·8	8,100	7·4	5,400	10·6	1,950			18
6·0	7,700	7·5	5,200	10·8	1,850			19
6·3	7,200	7·7	4,900	10·7	1,900			20
6·2	7,300	8·0	4,500	10·7	1,900			21
6·2	7,300	8·2	4,250	10·7	1,900			22
6·2	7,300	8·3	4,100	10·7	1,900			23
6·3	7,200	8·5	3,900	10·8	1,850			24
6·3	7,200	9·2	3,050	10·8	1,850			25
6·3	7,200	9·5	2,800	11·0	1,750			26
6·3	7,200	9·6	2,700	10·8	1,850			27
6·5	6,800	9·8	2,500	11·0	1,750			28
6·6	6,700	10·0	2,350	11·0	1,750			29
7·1	5,800	10·0	2,350	11·0	1,750			30
7·6	5,000			10·9	1,800			31

MONTHLY DISCHARGE of Columbia River, at Golden, for 1908.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second Feet.				Run-Off.	
	Maximum	Minimum.	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	2,800	1,575	2,000	0·8	0·9	119,000
May	7,200	2,450	5,505	3·2	2·5	338,500
June	13,900	6,800	11,320	4·53	5·1	672,400
July	18,500	12,000	14,887	5·95	6·9	915,300
August	12,300	5,000	8,438	3·37	3·9	518,800
September	5,400	2,350	4,016	1·6	1·8	239,200
October	2,350	1,750	1,993	0·79	0·9	118,400
November	2,050	1,500	1,600	0·64	0·7	95,200

NOTE.—Accuracy "A" up to 12,000 c.f.s., "B" over 12,000 c.f.s.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	April.		May.		June.		July.	
	Guage height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Guage height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	11·7	1,450	6·7	6,500	4·0	12,000
2	....	....	11·8	1,400	6·4	7,000	4·1	11,800
3	....	....	11·7	1,450	5·6	8,500	4·1	11,800
4	....	....	11·5	1,550	5·5	8,700	4·0	12,000
5	....	....	11·3	1,625	5·2	9,300	3·8	12,500
6	....	....	11·0	1,750	5·0	9,700	3·6	13,100
7	....	....	11·1	1,700	4·8	10,200	3·3	13,900
8	11·5	1,550	11·2	1,650	4·7	10,400	3·0	14,800
9	11·5	1,550	11·3	1,625	4·7	10,400	2·5	16,200
10	11·4	1,575	11·3	1,625	4·7	10,400	2·3	16,800
11	11·4	1,575	11·2	1,650	4·7	10,400	2·3	16,800
12	11·4	1,575	11·1	1,700	4·6	10,600	2·3	16,800
13	11·3	1,625	11·0	1,750	4·4	11,000	2·5	16,200
14	11·3	1,625	10·9	1,800	4·3	11,300	2·7	15,600
15	11·3	1,625	10·8	1,850	4·2	11,600	3·1	14,500
16	11·4	1,575	10·6	1,950	4·0	12,000	3·3	13,900
17	11·5	1,550	10·5	2,050	3·7	12,800	3·5	13,300
18	11·5	1,550	10·5	2,050	3·6	13,100	3·7	12,800
19	11·5	1,550	10·6	1,950	3·4	13,600	3·9	12,300
20	11·5	1,550	10·6	1,950	3·3	13,900	4·1	11,800
21	11·5	1,550	10·4	2,100	3·2	14,200	4·2	11,600
22	11·5	1,550	10·3	2,150	3·0	14,800	4·2	11,600
23	11·6	1,500	10·2	2,200	3·0	14,800	4·1	11,800
24	11·6	1,500	10·1	2,300	3·0	14,800	4·5	10,800
25	11·5	1,550	9·8	2,500	3·1	14,500	4·5	10,800
26	11·5	1,550	9·1	3,150	3·3	13,900	4·5	10,800
27	11·5	1,550	8·3	4,100	3·4	13,600	4·5	10,800
28	11·6	1,500	7·8	4,800	3·6	13,100	4·5	10,800
29	11·6	1,500	7·4	5,400	3·9	12,300	4·4	11,000
30	11·7	1,450	7·1	5,800	3·9	12,300	4·4	11,000
31	....	....	6·9	6,100	....	....	4·6	10,600

of Columbia River, at Golden, for 1909.

August.		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Guage height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
4·6	10,600	7·2	5,700	8·7	3,650	10·9	1,800	1
4·6	10,600	7·3	5,500	8·8	3,500	10·9	1,800	2
4·7	10,400	7·4	5,400	9·1	3,150	11·0	1,750	3
4·7	10,400	7·5	5,200	9·7	2,600	11·1	1,700	4
4·8	10,200	7·5	5,200	9·7	2,600	11·2	1,650	5
4·8	10,200	7·6	5,000	9·8	2,500	11·3	1,625	6
4·9	9·900	7·6	5,000	10·0	2,350	11·4	1,575	7
5·1	9,500	7·7	4,900	10·0	2,350	11·5	1,550	8
5·2	9,300	7·7	4,900	10·0	2,350	11·6	1,500	9
5·3	9,100	7·8	4,800	10·1	2,300	11·6	1,500	10
5·3	9,100	7·8	4,800	10·1	2,300	11·7	1,450	11
5·4	8,900	7,9	4,650	10·1	2,300	11·8	1,400	12
5·7	8,300	8·0	4,500	10·2	2,200	11·8	1,400	13
5·9	7,900	8·0	4,500	10·3	2,150	.....	.....	14
6·3	7,200	8·1	4,400	10·3	2,150	.....	.....	15
6·3	7,200	8·2	4,250	10·5	2,050	.....	.....	16
6·3	7,200	8·3	4,100	10·6	1,950	.....	.....	17
6·3	7,200	8·4	4,000	10·6	1,950	.....	.....	18
6·3	7,200	8·7	3,650	10·6	1,950	.....	.....	19
6·4	7,000	9·0	3,300	10·6	1,950	.....	.....	20
6·5	6,800	9·3	3,000	10·7	1,900	.....	.....	21
6·5	6,800	9·7	2,600	10·7	1,900	.....	.....	22
6·6	6,700	9·7	2,600	10·8	1,850	.....	.....	23
6·7	6,500	9·7	2,600	10·8	1,850	.....	.....	24
6·8	6,300	10·0	2,350	10·8	1,850	.....	.....	25
6·9	6,100	10·2	2,200	10·8	1,850	.....	.....	26
6·9	6,100	10·1	2,300	10·8	1,850	.....	.....	27
7·0	6,000	10·2	2,200	10·8	1·850	.....	.....	29
7·0	6,000	10·2	2,200	10·8	1,850	.....	.....	29
7 1	5,800	9·5	2,200	10·9	1,800	.....	.....	30
7 2	5,700			10·9	1,800	.....	.....	31

MONTHLY DISCHARGE of Columbia River, at Golden, for 1909.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second Feet.				Run Off.	
	Maximum.	Minimum.	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	1,625	1,450	1,500	0·6	0·7	89,300
May	6,100	1,400	2,423	0·97	1·1	148,800
June	14,800	6,500	11,856	4·7	5·2	705,500
July	16,800	10,600	12,919	5·17	5·9	794,300
August	10,600	5,700	7,912	3·18	3·7	488,200
September	5,700	2,200	3,933	1·57	1·7	233,900
October	3,650	1,800	2,214	0·89	1·0	135,900
November	1,800	1,400	1 400	0 56	0 6	83,300

NOTE.—Accuracy "A" up to 12,000 c.f.s., "B." over 12,000 c.f.s.

DAILY GAUGE HEIGHT AND DISCHARGE of Columbia River, at Golden, for 1910.

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	6·8	6,300	4·4	11,000	4·0	12,000
2	....	....	6·8	6,300	4·6	10,600	4·0	12,000
3	....	....	7·5	5,200	4·7	10,400	4·1	11,800
4	....	....	7·7	4,900	4·8	10,200	4·1	11,800
5	....	....	7·8	4,800	4·8	10,200	4·1	11,800
6	10·8	1,850	7·8	4,800	4·9	9,900	4·1	11,800
7	10·7	1,900	7·5	5,200	4,8	10,200	4·0	12,000
8	10·8	1,850	7·3	5·500	4·7	10,400	3·9	12,300
9	10·7	1,900	6·7	6,500	4·8	10,200	3·8	12,500
10	10·6	1,950	6·3	7,200	4·7	10,400	3·8	12,500
11	10·5	2,050	6·2	7,300	4·5	10,800	3·8	12,500
12	10·2	2,200	6·0	7,700	4·2	11,600	3·8	12,500
13	9·8	2,500	5·9	7,900	4·2	11,600	3·8	12,500
14	9·7	2,600	5·8	8,100	4·2	11,600	3·7	12,800
15	9·8	2,500	5·7	8,300	4·2	11,600	3·7	12,800
16	10·0	2,350	5·9	7,900	4·0	12,000	3·7	12,800
17	10·1	2,300	6·0	7,700	3·8	12,500	3·7	12,800
18	10·0	2,350	6·2	7,300	3·7	12,800	3·6	13,100
19	9·9	2,450	6·3	7,200	3·7	12,800	3·5	13,300
20	9·7	2,600	6·3	7,200	3·6	13,100	3·4	13,600
21	9·6	2,700	6·3	7,200	3·5	13,300	....	....
22	9·4	2,900	6·3	7,200	3·6	13,100	....	....
23	9·1	3,150	6·3	7,200	3·7	12,800	....	....
24	9·0	3,300	6·1	7,500	3·8	12,500	....	....
25	8·7	3,650	5·8	8·100	3·9	12,300	....	....
26	8·1	4,400	5·3	9,100	3·9	12,300	....	....
27	7·7	4,900	5·0	9,700	4·0	12,000	....	....
28	7·2	5,700	4·8	10,200	4·0	12,000	....	....
29	7·0	6,000	4·7	10,400	4·0	12,000	....	....
30	6·7	6,500	4·4	11,000	4·2	11,600	....	....
31	..	....	4·3	11,300	..		....	

MONTHLY DISCHARGE of Columbia River, at Golden, for 1910.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	6,500	1,850	3,000	1.2	1.3	178,500
May	11,300	4,800	7,491	3.0	3.5	460,500
June	13,300	9,900	11,593	4.64	5.2	684,300
July	13,600	11,800	13,000	5.2	6.0	799,300

NOTE.—No records after July.
Accuracy "A." up to 12,000 c.f.s.; "B." over 12,000 c.f.s.

DAILY GAUGE HEIGHT AND DISCHARG[E]

Day.	April. Gauge height.	April. Discharge.	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Dischatge.	July. Gauge height.	July. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	...	......	10·5	2,050	8·0	4,500	2·2	17,100
2	...	......	10·3	2,150	7·8	4,800	2·3	16,800
3	...	......	10·0	2,350	7·5	5,200	2·3	16,800
4	...	......	9·7	2,600	7·3	5,500	2·5	16,200
5	...	......	9·5	2,800	6·0	7,700	2·7	15,600
6	...	......	9·3	3,000	5·9	7,900	2·9	15,100
7	...	......	9·2	3,050	5·7	8,300	3·0	14,800
8	...	......	9·1	3,150	5·7	8·300	3·2	14,200
9	...	......	9·1	3,150	5·7	8·300	3·3	13,900
10	...	......	9·1	3,150	5·7	8,300	3·4	13,600
11	...	......	9·2	3,050	5·7	8,300	3·6	13,100
12	...	......	9·3	3,000	5·6	8,500	3·7	12,800
13	...	......	9·3	3,000	5·2	9,300	4·0	12,000
14	...	......	9·2	3,050	4·9	9,900	4·0	12,000
15	...	......	9·1	3,150	4·6	10,600	4·2	11,600
16	...	......	8·8	3,500	4·4	11,000	4·2	11,600
17	...	......	8·7	3,650	4·1	11,800	4·2	11,600
18	...	......	8·5	3,900	3·1	14,500	4·2	11,600
19	11·4	1,575	8·5	3,900	3·3	13,800	4·2	11,600
20	11·4	1,575	8·5	3,900	2·9	15,100	4·2	11,600
21	11·4	1,575	8·7	3,650	2·8	15,300	4·2	11,600
22	11·4	1,575	8·7	3,650	2·5	16,200	4·1	11,800
23	11·4	1,573	8·8	3,500	2·3	16,800	4·2	11,600
24	10·7	1,900	8·8	3,500	2·1	17,500	4·2	11,600
25	10·1	2,300	8·8	3,500	2·0	17,800	4·1	11,800
26	10·2	2,200	9·1	3,150	1·9	18,100	4·1	11,800
27	10·5	2,050	9·1	3,150	1·9	18,100	4·1	11,800
28	10·7	1,900	9·1	3,150	2·0	17,800	4·1	11,800
29	10·8	1,850	9·1	3,150	2·1	17,500	4·1	11,800
30	10·8	1,850	9·0	3,300	2·2	17,100	4·1	11,800
31	...		8·4	4,000	......	......	4·2	11,600

DAILY GAUGE HEIGHTS AND DISCHARGE of Columbia River, at Golden, for 1910.

August.		September.		October.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
4·3	11,300	7·3	5,500	10·3	2,150	1
4·4	11,000	7·1	5,800	10·4	2,100	2
4·4	11,000	7·0	6,000	10·4	2,100	3
4·5	10,800	7·0	6,000	10·4	2,100	4
4·6	10,600	6·9	6,100	10·4	2,100	5
4·8	10,200	7·0	6,000	10·5	2,050	6
5·0	9,700	7·2	5,700	10·6	1,950	7
5·1	9,500	7·5	5,200	10·6	1,950	8
5·2	9,300	7·1	5,800	10·6	1,950	9
5·2	9,300	8·3	4,100	10·6	1,950	10
5·3	9,100	8·5	3,900	10·6	1,950	11
5·4	8,900	8·5	3,900	10·6	1,950	12
5·6	8,500	8·3	4,100	10·7	1,900	13
5·8	8,100	8·2	4,250	10·7	1,900	14
5·9	7,900	8·2	4,250	10·8	1,850	15
6·0	7,700	8·1	4,400	10·8	1,850	16
6·1	7,500	8·5	3,900	10·8	1,850	17
6·2	7,300	9·1	3,150			18
6·3	7,200	9·3	3,000			19
6·4	7,000	9·5	2,800			20
6·4	7,000	9·7	2,600			21
6·5	6,800	9·7	2,600			22
6·6	6,700	9·8	2,500			23
6·7	6,500	9·9	2,450			24
6·8	6,300	10·0	2,350			25
7·0	6,000	10·1	2,300			26
7·2	5,700	10·2	2,200			27
7·3	5,500	10·2	2,200			28
7·4	5,400	10·2	2,200			29
7·4	5,400	10·3	2,150			30
7·4	5,400					31

MONTHLY DISCHARGE of Columbia River, at Golden, for 1911.

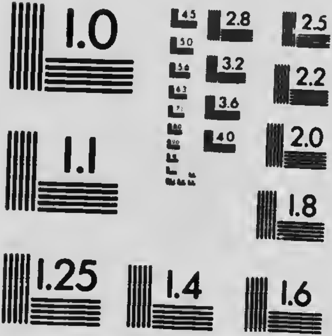
(Drainage area, 2,500 square miles.)

Month.	Discharge in Second Feet.				Run-Off.	
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April..	2,300	1,400	1,500	0·6	0·7	89,200
May.	4,000	2,050	3,201	1·8	1·5	196,800
June	18,100	4,500	11,793	4·71	5·3	701,700
July...	17,100	11,600	12,987	5·19	6·0	798,500
August...	11,300	5,400	8,019	3·21	3·7	493,000
September.	6,100	2,150	3,913	1·57	1·7	232,800
October..	2,150	1,850	1,900	0·76	0·9	116,800

NOTE.—Accuracy "A" up to 12,000 c.f.s.; "B" over 12,000 c.f.s.

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



DAILY GAUGE HEIGHT AND DISCHARGE

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			11·3	1,625	8·4	4,000	4·2	11,600
2			11·3	1,625	8·7	3,650	4·2	11,600
3			11·0	1,750	9·2	3,050	4·2	11,300
4			11·2	1,650	9·2	3,050	4·3	11,300
5			11·2	1,650	9·6	2,700	4·4	11,000
6	10·4	2,100	11·2	1,650	9·4	2,900	4·7	10,400
7	10·4	2,100	11·1	1,700	9·1	3,150	4·8	10,200
8	10·5	2,050	11·0	1,750	8·4	4,000	4·8	10,200
9	10·5	2,050	10·8	1,850	9·1	3,150	4·9	9,900
10	10·7	1,900	10·5	2,050	8·8	3,500	4·9	9,900
11	10·8	1,350	10·2	2,200	8·6	3,750	5·0	9,700
12	11·0	1,750	10·0	2,350	7·9	4,650	5·2	9,300
13	11·2	1,650	9·8	2,500	7·6	5,000	5·3	9,100
14	11·3	1,625	9·7	2·600	6·5	6·800	5·3	9,100
15	11·3	1,625	9·2	3,050	6·0	7,700	5·3	9·100
16	11·4	1,575	8·5	3,900	6·0	7,700	5·3	9,100
17	11·4	1,575	8·0	4,500	6·0	7,700	5·3	9,100
18	11·4	1,575	7·8	4,800	6·0	7,700	5·2	9,300
19	11·4	1,575	7·9	4,650	5·8	8,100	5·2	9,300
20	11·3	1,625	7·9	4,650	5·8	8,100	5·2	9,300
21	11·3	1,625	7·9	4,650	5·6	8,500	5·2	9,300
22	11·3	1,625	7·9	4,650	5·4	8,900	5·3	9·100
23	11·3	1,625	8·0	4,500	5·3	9,100	5·3	9,100
24	11·3	1,625	8·3	4,100	5·1	9,500	5·3	9·100
25	11·3	1,625	8·5	3,900	4·8	10,200	5·4	8,900
26	11·3	1,625	8·7	3,650	4·7	10,400	5·4	8,900
27	11·4	1,575	8·9	3,400	4·7	10,400	5·5	8,700
28	11·3	1,625	8·5	3,900	4·5	10,800	5·5	8,700
29	11·3	1,625	8·3	4,100	4·4	11,000	5·6	8,500
30	11·5	1,550	8·1	4,400	4·2	11,600	5·6	8,500
31	...		8·0	4,500		..	5·6	8,500

of Columbia River, at Golden, for 1912.

August.		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
5·7	8,300	8·2	4,250	10·5	2,050	11·6	1,500	1
5·7	8,300	8·3	4,100	10·5	2,050	11·6	1,500	2
5·7	8,300	8·3	4,100	10·5	2,050	11·6	1,500	3
5·6	8,500	8·5	3,900	10·4	2,100			4
5·4	8,900	9·0	3,300	10·4	2,100			5
5·3	9,100	9·0	3,300	10·4	2,100			6
5·3	9,100	9·1	3,150	10·5	2,050			7
5·4	8,900	9·2	3,050	10·5	2,050			8
5·6	8,500	9·3	3,000	10·5	2,050			9
5·7	8,300	9·3	3,000	10·6	1,950			10
5·8	8,100	9·3	3,000	10·7	1,900			11
5·8	8,100	9·3	3,000	10·7	1,900			12
5·8	8,100	9·4	2,900	10·8	1,850			13
5·8	8,100	9·4	2,900	10·8	1,850			14
5·9	7,900	9·4	2,900	10·8	1,850			15
6·0	7,700	9·4	2,900	10·8	1,850			16
6·0	7,700	9·5	2,800	10·7	1,900			17
6·2	7,300	9·5	2,800	10·7	1,900			18
6·3	7,200	9·5	2,800	10·7	1,900			19
6·3	7,200	9·5	2,800	10·6	1,950			20
6·4	7,000	9·5	2,800	10·7	1,900			21
6·4	7,000	9·5	2,800	10·8	1,850			22
6·5	6,800	9·6	2,700	10·8	1,850			23
6·5	6,800	9·6	2,700	10·8	1,850			24
6·7	6,500	9·6	2,700	10·8	1,850			25
6·7	6,500	9·7	2,600	10·9	1,800			26
7·1	5,800	9·7	2,600	10·9	1,800			27
7·3	5,500	9·9	2,450	11·0	1,750			28
7·7	4,900	10·0	2,350	11·1	1,700			29
7·8	4,800	10·2	2,200	11·3	1,625			30
8·0	4,500			11·5	1,550			31

MONTHLY DISCHARGE of Columbia River, at Golden, for 1912.

(Drainage area, 2,500 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum.	Minimum.	Meun	Per sq. mile.	Depth in inches on Drainage area.	Total in ucre-feet.
April	2,100	1,550	1,750	0·7	1·8	104,100
May	4,800	1,625	3,169	1·27	1·5	195,000
June	11,600	2,700	6,725	2·69	3·0	399,900
July	11,600	8,500	9,594	3·84	4·4	589,700
August	9,100	4,500	7,732	3·09	3·6	475,300
September	4,250	2,200	2,995	1·2	1·3	177,300
October	2,100	1,550	1,900	0·76	0·9	116,800

NOTE.—River froze on November 4. Minimum discharge for 1912 occurred February 20, and was 795 c.f.s.
Accuracy "A" up to 12,000 c.f.s.; "B" over 12,000 c.f.s.

COLUMBIA RIVER (FROM GOLDEN TO REVELSTOKE).

Columbia river from Golden to Surprise rapids, at the north limit of the Railway Belt, is navigable for small boats, there being a small rapid between Donald and Beavermouth. In fact, the river can be run by boats and canoes almost to Revelstoke, but it is rather a dangerous trip.

Between Beavermouth and Surprise rapids the river runs through a valley somewhat similar to the upper Columbia valley above Golden, with side channels and sloughs.

There is not much agricultural land between Golden and Revelstoke, except heavily timbered country, and there are but few settlers. Valuable timber is found along the valley and the many tributaries. Some mining is carried on, but the copper and galena ores do not pay very well on account of their low grade and the lack of transport facilities. In the Selkirks lying in the embrace of the Columbia to the 'Big Bend,' are found valuable mica deposits.

The important tributaries of Columbia river from Golden to Revelstoke are: Kicking Horse river, Blaeberry river, Bluewater river, Waitabit creek, Beaver river, Gold creek and Bush river, all within the Railway Belt. Then there are Wood river, Canoe river, Downie creek, Gold stream, and many other smaller tributaries. Coming into the Railway Belt again, above Revelstoke, we have Carnes creek, LaForme creek and Jordan river.

There are numerous falls and rapids, the principal one being about four miles above Revelstoke. With a head of 25 feet considerable power c uld be developed, but it would involve great expense.

A powerful flat bottom steamer navigates the Columbia from just above Revelstoke to Priest rapids above Downie creek.

Columbia valley from Revelstoke through the 'Big Bend' has a humid climate, with a precipitation of from 40 to 100 inches, mostly snowfall in the lofty mountains, especially in the Selkirks.

Below Revelstoke the Columbia is navigable, and large C.P.R. steamers ply on the Arrow lakes.

Columbia River (at Revelstoke) (401).

The station on Columbia river at Revelstoke was established on October 12, 1911, by C. E. Richardson.

The measuring section is located on the traffic bridge immediately below the C. P. R. bridge and about 1½ miles from the C. P. R. station at Revelstoke. Illecillewaet river empties into the Columbia about one mile below the ganging station.

The gauge is a chain gauge. From tip to tip the length is 55·53 feet. The graduations from 0 to 20 feet are located on the handrail on the downstream side of the bridge, about 75 feet from the near side of the bridge approaching from town.

Measurements are made from the upstream side of the bridge. About 90 feet of cable is needed to suspend the meter, and 15 pounds of lead generally used, but at high water 30 pounds are necessary. At extreme high water the current is so fast that it is difficult to sink the meter to the required depths, and surface velocities have to be taken.

The initial point for soundings is at the left abutment of the bridge (looking downstream), on the upstream side of the bridge. The point is marked on the handrail in blue paint.

The channel above the station is straight for about 300 yards, and below the station is straight for 800 yards. The river broadens below the station. The water is fairly swift. There are a few eddies around some of the piers. The right bank is low and at very high water is flooded, but only a small percentage of the water flows over the sandbars. The left bank is about 60 feet high. The bed of the stream is sand and gravel and is liable to shift. At low water the river flows through five piers, and through seven at high water. The river varies from 25 to 35 feet in depth in the deepest channel. The difference between high and low water level on an average year is about 9 feet, but it was about 11 feet higher than the average in the famous flood year of 1894.

The high-water mark of 1894 is equivalent to 24·01 feet on the hydrographic survey gauge.

Three bench-marks were established to which the datum of the gauge was referred.

Discharge Measurements of Columbia River, at Revelstoke, B.C., for 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet	Sq. ft.	Ft per sec	Feet.	Sec.-ft.
1911.							
Oct. 12	C. E. Richardson.	1,048	700	4,990	2·7	5·45	13,300
1912.							
Feb. 27	..	1,048	460	3,170	1·4		4,460
Apr. 19	..	1,048	710	5,140	2·6	5·54	13,000
May 22	.. (H. C. Hughes)	1,055	840	8,280	5·0	11·8	41,500†
June 18	..	1,048	960	12,500	7·8	15·5	96,900
June 24	..	1,048	1,010	15,700	8·6	18·2	135,000
Aug. 20	..	1,048	840	10,200	6·4	12·75	65,500
Sept. 14	..	1,055	820	7,570	4·8	9·2	36,400
Oct. 4	..	1,055	710	6,230	3·1	7·3	19,700

Note.—In all widths, except in measurements, under ice-cover, the width of five piers is included.
*Ice-cover.
†Meter out of order.

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	February.		March		April.		May.		June.		July.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1							6·4	17,000	9·6	37,000	14·3	81,600
2							6·5	17,500	9·7	37,750	14·3	81,600
3							6·55	17,750	9·7	37,750	14·4	82,800
4							6·7	18,500	10·1	40,850	14·3	81,600
5							6·8	19,000	11·4	52,300	14·2	80,400
6							6·9	19,500	12·2	59,900	14·4	82,800
7					4·0	8,500	7·0	20,000	12·8	65,600	14·1	79,200
8					3·8	8,000	8·2	26,900	13·1	68,550	13·7	74,850
9					4·0	8,500	8·7	30,400	13·2	69,600	13·4	71,700
10					4·15	8,950	8·7	30,400	13·8	75,900	14·1	79,200
11					4·3	9,400	8·7	30,400	14·8	87,600	14·0	78,000
12					4·6	10,300	8·6	29,700	14·7	86,400	14·1	79,200
13					4·7	10,600	9·1	33,250	14·3	81,600	14·9	88,800
14				.....	5·2	12,200	10·0	40,000	13·8	75,900	14·3	81,600
15			4·0	8,500	5·25	12,375	11·4	52,300	13·2	69,600	14·3	81,600
16			3·9	8,250	5·5	13,250	12·5	62,750	13·9	76,950	13·8	75,900
17			3·9	8,250	5·5	13,250	12·35	[illegible],325	14·7	86,400	13·5	72,750
18			3·9	8,250	5·5	13,250	11·7	55,150	15·5	96,250	13·6	73,800
19			4·0	8,500	5·6	13,600	10·9	47,650	16·1	103,950	13·8	75,900
20			3·95	8,375	5·7	13,950	11·1	49,450	16·8	114,100	14·1	79,200
21			3·9	8,250	5·9	14,650	11·4	52,300	17·4	122,800	14·2	80,400
22			3·8	8,000	5·95	14,825	11·8	56,100	17·8	128,600	14·2	80,400
23			3·95	8,375	6·1	15,500	12·0	58,000	18·2	134,400	14·1	79,200
24			3·8	8,000	6·1	15,500	12·1	58,950	18·1	152,950	14·0	78,000
25			....	8,150	6·0	15,000	12·1	58,950	18·3	135,850	14·5	84,000
26		...	3·92	8,300	6·05	15,250	12·4	61,800	18·7	141,650	14·2	80,400
27		4,460	3·9	8,250	6·0	15,000	12·8	65,600	17·8	128,600	13·7	74,850
28			3·9	8,250	6·0	15,000	12·8	65,600	15·7	98,750	13·2	69,600
29				8,525	6·1	15,500	11·7	55,150	14·5	84,000	13·7	74,850
30			4·1	8,800	6·2	16,000	10·9	47,650	14·5	84,000	13·7	74,850
31							10·2	41,700	......		14·3	81,600

Columbia River, at Revelstoke, B.C., for 1912.

August.		September.		October.		November.		December.		
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height	Discharge.	Gauge height	Discharge.	Gauge height	Discharge.	Day.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
14·4	82,800	9·9	39,750		16,500	5·4	12,900	4·3	9,400	1
14·6	85,000	9·4	35,500		16,500	5·3	12,550	4·4	9,700	2
14·8	87,600	9·0	32,500		16,500	5·3	12,550	4·7	10,600	3
15·0	90,000	8·7	30,400		16,500	5·3	12,550	5·1	11,850	4
15·7	98,750	8·7	30,400	....	16,500	5·2	12,200	....	11,700	5
14·8	87,600	8·6	29,700		16,500	5·2	12,200	5·0	11,500	6
13·7	74,850	8·5	29,000	....	16,500	5·1	11,850	4·8	10,900	7
13·5	72,750	8·5	29,000		16,500	5·1	11,850	4·5	10,000	8
14·2	80,400	8·5	29,000		16,500	5·2	12,200	4·3	9,400	9
14·5	84,000	9·0	32,500		16,500	5·1	11,850	4·3	9,400	10
14·3	81,600	9·1	33,250		16,500	5·0	11,500	4·2	9,100	11
13·8	75,900	9·1	33,250	....	16,500	4·9	11,200	4·1	8,800	12
12·7	64,650	9·3	34,750	....	16,500	4·9	11,200	4·2	9,100	13
12·5	62,750	9·2	34,000		16,500	4·8	10,900	4·3	9,400	14
12·8	65,600	8·7	30,400		16,500	4·8	10,900	4·3	9,400	15
13·7	74,850	8·4	28,300		16,500		10,900			16
12·8	65,600	8·3	27,600		16,500		10,900			17
12·7	64,650	8·1	26,200		16,500	4·8	10,900			18
12·7	64,550	8·0	25,500		16,500	4·9	11,200			19
12·8	65,600	8·0	25,500		16,500	5·1	11,850			20
13·3	70,650	7·9	24,950	6·4	17,000	5·1	11,850			21
14·0	78,000	7·4	22,200	6·4	17,000	5·0	11,500			22
14·9	88,800	7·2	21,100	6·3	16,500	5·0	11,500			23
16·1	103,950	7·1	20,550	6·0	15,000	5·1	11,850			24
15·8	100,000	6·9	19,500	5·7	13,950	5·0	11,500			25
14·7	86,400	6·7	18,500	5·6	13,600	5·0	11,500			26
13·7	74,850	6·4	17,000	5·5	13,250	4·8	10,900			27
12·7	64,650	6·4	17,000	5·6	13,600	4·6	10,300			28
12·0	58,000	6·3	16,500	5·6	13,600	4·5	10,000			29
10·9	47,650	6·2	16,000	5·5	13,250	4·4	9,700			30
10·5	44,250			5·4	12,900					31

MONTHLY DISCHARGE of Columbia River, at Revelstoke, for 1912.
(Drainage area, 9,000 square miles.)

Month.	Discharge in Second Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
March ...	8,800	5,000	7,280	0·8	0·9	448,000
April ...	16,000	8,000	12,000	1·3	1·45	714,000
May ...	65,600	17,000	42,000	4·7	5·4	2,580,000
June ...	142,000	37,000	87,000	9·7	10·8	5,190,000
July ...	88,800	71,700	78,700	8·7	10·0	4,840,000
August ...	104,000	44,200	75,700	8·4	9·7	4,650,000
September ..	39,250	16,000	27,000	3·0	3·3	1,610,000
October ..	17,000	12,900	15,795	1·75	2·02	971,000
November ...	12,900	9,700	11,492	1·28	1·43	684,000

NOTE.—Station established October 12, 1911. Freeze-up occurred November 5, 1911. Channel opened March 1, 1912. Freeze-up occurred middle of December, 1912.
Accuracy, "A."

COLUMBIA RIVER AT ATHALMER (404).

The station on Columbia river at Athalmer, B.C., was established on May 28, 1912, by C. E. Richardson, assisted by H. C. Hughes. The measuring section is located on the upstream side of the highway bridge, about 100 yards below lake Windermere, at the town of Athalmer. Toby creek empties into the Columbia about 1 mile below the station. The gauge is a vertical staff 2 inches by 4 inches by 4 feet, marked in feet and tenths in black paint. It is fastened to a pile on the left side of the stream (looking downstream), beneath the above-mentioned bridge. Measurements were made with Price's Electric Current Meter (small) and 6½ pounds of lead suspended by a cable. The initial point for sounding is located at the left abutment of the bridge on the downstream side. The channel above and below the section is straight for 100 yards and the water is sluggish except during high water on lake Windermere. At all stages the river is confined between the abutments of the bridge. The bed of the stream on the left side is gravelly and clean, suitable for navigation during the summer months. On the right side the stream is shallow, sluggish and filled with vegetation.

The fall between the gauging section and the mouth of Toby creek, one mile downstream, is very small, and when Toby creek has its freshet flow the water is backed up on the gauge. In extreme cases the flow in Columbia river is reversed and logs driven down Toby creek have been carried into lake Windermere. So at Athalmer, as at Spillimacheen, the gauge readings are only of value in connection with navigation and the proposed reclamation of the overflow land in the Upper Columbia valley.

The following bench-marks were located with reference to the gauge datum:—

B.M. No. 1.—Located on an electric light pole on the left bank, immediately below the bridge. Elevation 7·96.

B.M. No. 2.—Located on a cribbing on the left bank about 35 feet above the bridge. Elevation 4·79.

B.M. No. 3.—Located on the left bridge abutment on the upstream side of the bridge. Elevation 6·26.

DISCHARGE MEASUREMENTS of Columbia River, at Athalmer, B.C., for 1912.

Date.	Hydrographer.	Meter No	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1912.							
May 28	H. C. Hughes	1055	121	238	1·46	2·30	340
June 12	"	1055	149	364	1·05	3·39	382
" 29	"	1055	157	614	1·91	5·06	1,180
July 22	"	1055	160	580	1·56	4·52	902
Sept. 28	C. Richardson	1055	137	240	1·71	2·43	410

MEAN DAILY GAUGE HEIGHT, in feet, of Columbia River, at Athalmer, for June, July, August and September 1912.

Day.	June.	July.	August.	September.
1	2·3	4·8	4·42	3·31
2	2·32	4·84	4·43	3·22
3	2·24	4·7	4·47	3·16
4	2·25	4·62	4·5	3·17
5	2·26	4·66	4·4	3·05
6	2·[illegible]	1·62	4·27	3·0
7	2·55	4·6	4·25	2·92
8	2·84	4·6	4·18	2·92
9	2·95	4·57	4·16	2·92
10	3·06	4·56	4·16	2·91
11	3·15	4·52	1·16	2·86
12	3·36	4·41	4·13	2·85
13	3·57	4·75	4·02	2·8
14	3·61	4·82	3·92	2·75
15	3·68	4·68	3·9	2·7
16	3·62	4·68	3·9	2·7
17	3·78	4·61	3·82	2·67
18	3·95	4·53	2·77	2·65
19	4·15	4·55	3·7	2·6
20	4·33	4·56	3·77	2·6
21	4·53	4·53	3·66	2·55
22	4·71	4·57	3·72	2·55
23	4·97	4·51	3·78	2·55
24	5·1	4·5	3·82	2·52
25	5·25	4·48	3·85	2·5
26	5·32	4·46	3·75	2·5
27	5·47	4·42	3·61	2·5
28	5·37	4·38	3·56	2·5
29	5·02	4·37	3·5	2·47
30	4·95	4·42	3·46	2·35
31		4·42	3·42	

COLUMBIA RIVER AT SPILLIMACHEEN (403.)

The station on Columbia river at Spillimacheen was established on June 2, by H. C. Hughes. The measuring section is located on the downstream side of the highway bridge on the road from Spillimacheen Landing to Spillimacheen river, Bugaboo river and the west side of the upper valley. Lake Windermere is 40 miles south, and Golden is 40 miles north. The gauge is a vertical staff, 2 inches by 4 inches by 13 feet (cedar) marked in feet and tenths in black paint. It is fastened to the upstream end of a wharf on the west bank of the river, about 300 feet below the bridge. There is another (private) gauge fastened to the same wharf some 20 feet downstream, on which readings have been taken for some years by H. G. Low. Measurements were made with Price's Electric Current Meter (small) and 6½ pounds weight suspended by a cable. The initial point for sounding is at the right abutment of the bridge (looking downstream) on the downstream side. The channel above and below the gauging section is straight for 200 feet; the water is sluggish. At low water the river is confined between the bridge abutment, but at high water the surrounding flats are covered, and two or three small side channels exist. These flats are covered with small underbrush. The bed of the stream is silt and is liable to shift. The depth varies from 10 feet to 25 feet.

Spillimacheen river flows into the Columbia about 1 mile below the gauging section, and when it is in flood it backs up water to the gauge. Gauge readings, however, were taken in the summer of 1912 to determine the rise and fall of the river. These may be found of value with reference to navigation and the proposed reclamation scheme to reclaim some 50,000 acres of overflow land in Upper Columbia valley.

The following bench-marks were established with reference to the gauge datum:—

B.M. No. 1.—Located on the southeast corner of the wharf, to which the gauge is attached. Elevation 11·56.

B.M. No. 2.—Located on a pile, 15 feet upstream from the above-mentioned wharf. Elevation 12·16.

B.M. No. 3.—Located on a cottonwood tree opposite the wharf, 30 feet from the water. Elevation 14·58.

The zero of H. G. Low's gauge is 1'·62 above the zero of the Hydrographic Survey gauge.

Discharge Measurements of Columbia River, at Spillimacheen, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1912.							
May 30 ...	H. C. Hughes..	1055	163	1,760	1·14	3·55	2,090
June 17...	"	1055	230	2,550	1·69	7·78	4,300
June 20....	"	1055	230	2,710	1·79	8·54	4,860
July 4	"	1055	235	2,820	2·21	8·64	6,230
July 17....	"	1055	230	2,760	2·17	8·36	6,000
Sept. 30	C. E. Richardson..	1055	140	1,510	0·80	3·02	1,210

Note.—Gauge heights are affected by backwater from the Spillimacheen river, which empties into the Columbia about 1 mile below the gauging section.

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MEAN DAILY GAUGE HEIGHT, in feet of Columbia River, Spillimacheen, June 2 to October 2, 1912.

Day.	June.	July.	August.	September.	October.
1		9·4	8·1	6·0	3·0
2	4·52	9·2	8·2	5·6	3·0
3	4·4	9·1	8·3	5·4	
4	4·3	8·75	8·4	5·3	
5	4·15	8·5	8·85	5·2	
6	4·15	8·5	8·5	4·9	
7	4·5	8·4	8·2	4·8	
8	5·5	8·3	8·0	4·7	
9	6·5	8·3	8·0	4·6	
10	6·8	8·3	8·0	4·5	
11	6·9	8·3	8·0	4·4	
12	7·0	8·3	7·8	4·2	
13	7·7	8·3	7·4	4·6	
14	7·95	8·4	7·1	4·6	
15	7·75	8·4	6·9	4·3	
16	7·4	8·4	7·2	4·2	
17	7·5	8·4	7·1	4·1	
18	7·7	8·4	6·8	4·1	
19	8·0	8·3	6·7	4·0	
20	8·5	8·3	6·2	3·9	
21	8·7	8·3	6·4	3·8	
22	9·0	8·3	6·8	3·7	
23	9·4	8·3	7·4	3·6	
24	9·7	8·3	7·7	3·6	
25	9·9	8·2	8·1	3·5	
26	10·1	8·1	7·9	3·4	
27	10·35	8·0	7·5	3·3	
28	10·3	7·8	7·3	3·2	
29	10·0	7·8	6·8	3·1	
30	9·7	8·0	6·7	3·0	
31		8·1	6·3		

COQUIHALLA RIVER (119).

Coquihalla river has its source in the pass between Coquihalla and Coldwater rivers, at an elevation of 3,000 feet, and discharges into Fraser river near Hope, at an elevation of 120 feet. It is part of the [illegible] drainage: the drainage area, as measured from a Dominion sectional map, scale 3 [illegible] to an inch, is 360 square miles. The annual precipitation varies from 50 inches at the mouth to about 80 inches at the head-waters, where the winters are more severe.

The following tributaries enter from the left [illegible] stream, Kaw[illegible]awa, Ladner, and Boston Bar creeks, while Nicolum creek and Pi[illegible] enter from the right. Just above the mouth of the Nicolum, about six mile[illegible] mouth of the Coquihalla, is the site of a proposed power development. [illegible] in extent. The river flows through a gorge with precipitous rocky wa[illegible] 70 feet in width, and about 150 feet in height. By constructing a dam [illegible] of the gorge, and a tunnel through the mountains for about 1,000 feet [illegible] power site, a head of from 100 to 125 feet could be obtained. Storage facilit[illegible] however, are indefinite yet, and may be limited by the railroad construction in [illegible] valley. A few hundred feet below the mouth of the Nicolum, there is another [illegible] canyon and falls; but to use this section of the river in conjunction with the other w[illegible] be very expensive.

The river station on the Coquihalla was establish[illegible] 10, 19[illegible] by C. G. Cline. It is located at the upper highway bridge, a mile [illegible] A chain gauge 24 feet long is attached to the middle of the bridge on [illegible] downstream side, and its datum is referred to three bench-marks. Cable meas[illegible] from the downstream side of the bridge. This makes a good measuring section, the control is good, the banks are high, the current uniform, and a rocky permanent channel bed. In very high water the river might flow in two channels, but entirely under the bridge.

DISCHARGE MEASUREMENTS of Coquihalla River, near Hope, B.C., 1911-12.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet	Sec.-ft
Nov. 16.	C. G. Cline...	1053	75	146	2·3	1·15	*330
Dec. 12	K. H. Smith........	1057	100	285	4·3	2·05	*1,219
1912.							
Feb. 29	C. G. Cline...	1046	95	174	2·4	1·25	*422
June 8	Cline and Corbould	1046	149	597	4·8	3·30	†2,880
June 29	C. G. Cline..	1046	122	275	3·2	1·90	†890
Sept. 13	"	1046	110	171	2·0	1·05	†334
Nov. 15	"	1048	120	276	2·8	1·65	†760
Nov. 18	"	1048	120	350	3·5	2·25	†1,210
Nov. 20	"	1048	120	386	3·9	2·45	†1,510

*These measurements apply to curve No. 1. Gauge destroyed and section altered.
†These measurements apply to curve No. 8. Chain gauge was established April 10.

DAILY GAUGE HEIGHT AND DISCHARGE of Coquihalla River, near Hope, B. C., for 1911.

DAY.	NOVEMBER.		DECEMBER.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·8	950
2			1·8	950
3				900
4			1·7	850
5			1·7	850
6			1·6	750
7			1·6	750
8				750
9			1·6	750
10			1·8	950
11			2·0	1,160
12			1·9	1,050
13				1,000
14			1·8	950
15			1·8	950
16			1·8	950
17	1·1	310		800
18	2·3	1,500	1·5	650
19	3·95	3,560	1·5	650
20	4·0	3,630	1·5	650
21	2·9	2·210	1·5	650
22	2·6	1,850		910
23	2·25	1,440	2·0	1,160
24	2·1	1,270		1,000
25	1·95	1,100	1·7	850
26	2·3	1,500	1·6	750
27	2·0	1,160	1·5	650
28	1·95	1,100	1·5	650
29	1·80	950		560
30	1·80	950	1·3	470
31	1·80	950		470

MONTHLY DISCHARGE of Coquihalla River, near Hope, B. C., for 1911.

(Drainage area, 380 square miles.)

Month.	DISCHARGE IN SECOND-FEET.				RUN-OFF.		RAIN-FALL.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
November	3,630	310	*1,000	2·8	3·1	59,500	
December	1,160	470	819	2·3	2·6	50,400	
The period							50 to 70

NOTE.—Accuracy, "A" and "C."
*Estimated.

DAILY GAUGE HEIGHT AND DISCHARG…

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·3	470	2·1	1,270	1·4	560	....	740	....	1,150	2·7	1,730
2	....	470	....	1,110	....	530	Curve.	780	2·15	1,140	2·8	1,850
3	....	470	1·8	950	....	500	No. 2	820	....	1,140	2·65	1,670
4	1·3	470	....	900	1·3	470	....	860	2·15	1,140	....	2,010
5	....	500	1·7	850	....	430	....	900	..	1,480	3·2	2,360
6	....	530	....	850	1·2	390	....	930	..	1,810	3·35	2,570
7	1·4	560	....	850	....	390	....	970	3·05	2,150	....	2,750
8	....	560	1·7	850	1·2	390	....	1,010	....	2,740	3·6	2,940
9	....	560	....	900	....	370	....	1,050	3·85	3,330	....	2,720
10	1·4	560	1·8	950	....	350	2·1	1,090	3·35	2,570	3·3	2,500
11	1·4	560	....	1,050	....	330	....	955	3·35	2,570	3·25	2,430
12	....	1,090	2·0	1,160	1·1	310	1·8	830	....	3,050	3·3	2,500
13	2·4	1,610	....	1,160	....	310	1·8	830	3·97	3,540	3·25	2,430
14	2·8	2,090	2·0	1,160	....	310	1·8	830	5·02	5,600	3·05	2,150
15	2·4	1 610	2·0	1,160	....	310	....	830	4·75	5,020	2·8	1,850
16	....	,390	2·1	1,270	1·1	310	....	830	4·15	3,860	....	2,140
17	....	1,170	....	1,210	....	310	1·8	830	....	2,940	3·25	2,430
18	1·8	950	2·0	1,160	1·1	310	1·7	750	2·95	2,030	3·22	2,390
19	....	900	2·0	1,160	....	280	1·7	750	....	2,760	3·35	2,570
20	1·7	850	2·0	1,160	....	260	....	780	3·95	3,500	....	2,460
21	1·7	850	....	1,050	1·0	230	....	800	3·95	3,500	3·2	2,360
22	1·7	850	1·8	950	....	310	1·8	830	3·75	3,170	2·65	1,670
23	....	880	....	900	1·2	390	....	830	....	2,940	....	1,730
24	....	920	1·7	850	....	430	1·8	830	3·45	2,710	2·75	1,790
25	1·8	950	....	850	curve	470	....	830	3·45	2,710	2·55	1,550
26	....	950	1·7	850	No. 1	500	1·8	830	....	2,710	2·55	1,550
27	1·8	950	1·6	750	....	540	1·8	830	3·45	2,710	....	1,320
28	....	950	1·5	650	.	580	....	1,000	3·35	2,570	2·1	1,090
29	1·8	950	1·3	470	.	620	2·2	1,190	3·05	2,150	2·02	1,020
30	2·8	? 090			..	660	.	1,180	2·85	1,910	....	1,010
31	2·3	1,500				700			2·85	1,910		

Coquihalla River, near Hope, B.C., for 1912.

July.		August.		September.		October.		November.		December.		Day.
Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
2·0	1,000	......	390	......	520	......	230	......	340	......	750	1
2·5	1,500	1·1	370	1·5	600	0·75	230	0·95	310	1·7	750	2
2·05	1,050	......	360	1·4	540	1·45	570	......	325	......	830	3
2·1	1,090	......	340	......	490	......	420	......	340	1·9	910	4
2·5	1,500	1·0	330	......	440	0·85	270	......	355	1·7	750	5
2·2	1,190	......	330	1·15	395	0·7	210	1·10	370	......	790	6
......	1,030	1·0	330	......	280	......	375	1·10	370	1·55	635	7
1·85	870	0·95	310	1·1	370	1·40	540	1·25	455	......	635	8
1·9	910	......	425	......	440	......	450	1·30	480	1·55	635	9
1·85	870	1·4	540	1·35	510	......	360	......	810	......	600	10
1·85	870	......	480	1·3	480	0·85	270	......	1,140	1·45	570	11
1·8	830	1·2	430	......	440	0·87	280	......	1,470	......	520	12
2·4	1,390	......	490	......	400	......	460	2·75	1,790	1·3	480	13
1·85	870	......	550	......	360	......	640	2·15	1,140	1·40	540	14
1·85	870	......	610	0·97	320	......	810	1·80	830	......	530	15
......	750	1·6	670	1·15	395	......	1,010	1·70	750	......	520	16
1·55	635	1·55	635	1·0	330	2·2	1,190	......	1,120	1·35	510	17
......	670	......	670	1·0	330	1·65	710	2·5	1,500	1·5	600	18
1·65	710	1·65	710		310	1·55	635	......	1,470	1·5	600	19
......	640	......	610	......	290	......	540	2·45	1,445	......	540	20
1·45	570	1·35	510	......	270	......	460	......	1,590	1·3	480	21
1·45	570	1·3	480	0·8	250	1·1	370	2·7	1,730	......	510	22
1·4	540	......	470	......	260	......	360	3·05	2,150	1·4	540	23
1·4	540	1·25	455	......	270	1·05	350	......	1,770	1·3	480	24
......	545	......	440	......	280	......	390	2·4	1,390	......	480	25
1·42	550	1·2	430	0·9	290	1·2	430	2·2	1,190	1·3	480	26
1·3	480	......	400	......	270	1·2	430	2·0	1,000	......	495	27
1·25	455	......	370	0·8	250	1·2	430	......	920	1·35	510	28
......	440	1·02	340	......	240	......	410	......	830	......	525	29
1·2	430	1·05	350	0·75	230	1·15	395	1·7	750	1·4	540	30
	410	......	440				365				480	31

MONTHLY DISCHARGE of Coquihalla River, near Hope, B. C., for 1912.

(Drainage area, 360 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	2,090	470	942	2·6	3·0	57,900	
February	1,270	470	981	2·7	2·9	56,400	
March	700	230	415	1·2	1·4	25,500	
April	1,190	740	884	2·5	2·8	52,600	
May	5,600	1,140	2,662	7·4	8·5	163,700	
June	2,940	1,010	2,059	5·7	6·4	122,600	
July	1,500	410	799	2·2	2·5	49,100	
August	710	310	460	1·3	1·5	28,300	
September	600	230	365	1·0	1·1	21,700	
October	1,190	210	471	1·3	1·5	29,000	
November	2,150	310	1,004	2·8	3·1	59,500	
December	910	480	587	1·6	1·8	36,100	
The year	5,600	210	969	2·7	36·5	702,400	50 to 70

NOTE.—The first gauge was destroyed March 23, when old bridge was torn down. New gauge established April 10. Discharges up to March 23 are from curve No. 1. From April 10 on, they are from curve No. 2. Between these two dates they are estimated. Open conditions exist all year.
Accuracy "A" up to 3,000 c.f.s.; "C" above 3,000 c.f.s.

CORNWALL CREEK (209.)

Cornwall creek rises in Cornwall lake at an elevation of 2,000 feet, and discharges into Thompson river below Ashcroft, at an elevation of 900 feet. It is part of the Thompson drainage. The area of its watershed is about 35 square miles. The water is used for irrigation, and a pipe has been laid to supply domestic water to two ranch houses. In the early days of the traffic along the Cariboo road, there was a flour-mill at Cornwall creek which was run by a large overshot water-wheel using water from the creek. The stream is in the dry belt, with a mean annual precipitation of from 8 to 10 inches.

Cornwall lake is about 2 miles long and a quarter of a mile wide. There is a dam at the outlet and it provides good storage and regulation for the creek, except that there seems to be some loss by seepage. In dry years all the water in the creek is used, and even then there is often not sufficient to irrigate the Cornwall estate, so that some years only one crop of alfalfa can be grown.

The gauging station is about 500 yards above Mr. F. V. Cornwall's house, which is on the bank of the creek, four miles from Ashcroft. The gauge is a vertical staff nailed to a tree stump 200 feet above the old diversion, on the west side of the creek. The meter measurements are made by wading. At low water they can be made at a section one foot below the gauge, but the overhanging bank prevents this at high water, and it is then necessary to go farther down the stream. The channel above the gauge is straight for 50 feet, and the water is swift. Below the gauge the channel is straight for 100 feet, with swift water. Both banks are high and wooded. The left bank overhangs the stream near the gauge, and meter measurements should not be taken there at high water. The bed of the stream is covered with gravel and rocks. There is only one channel, with the water about six inches deep. Brush jams are liable to form in the stream, and this tendency would be aided by the presence of large boulders along the bank.

DISCHARGE MEASUREMENTS OF CORNWALL CREEK, four Miles from the Mouth, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1911.							
Oct. 3.......	Cline and Smith..	1046	4·5	1·9	0·3	0·81	0·54
1912.							
May 7.......	C. G. Cline....	1046	6·0	3·15	1·1	1·0	3·5
May 12......	"	1046	7·0	4·3	1·6	1·12	6·7
June 21......	Cline and Corbould.	1046	5·4	1·9	1·1	0·95	2·1
July 9.......	B. Corbould..	1044	4·7	2·2	3·1	1·13	6·7
July 29......	"	1044	5·5	2·8	1·3	1·0	3·6
Aug. 16......	"	1044	3·5	1·6	1·1	0·91	1·8

DAILY GAUGE HEIGHT AND DISCHARGE OF CORNWALL CREEK, four Miles from Mouth, for 1911.

Day.	October. Gauge height.	October. Discharge.
	Feet.	Sec.-ft.
1...		
2...	0·8	0·4
3...		
4...		
5...		
6...		
7...		
8...	0·8	0·4
9...	0·8	0·4
10...	0·8	0·4
11...	0·8	0·4
12...	0·8	0·4
13...	0·8	0·4
14...		
15...		
16...		
17...		
18...		
19...	0·8	0·4
20...	0·8	0·4
21...	0·8	0·4
22...	0·8	0·4
23...	0·8	0·4
24...	0·8	0·4
25...		
26...		
27...		
28...		
29...		
30...		
31		

DAILY GAUGE HEIGHT AND DISCHARGE of Cornwall Creek, four Miles from Mouth, for 1912.

Day.	April. Gauge height.	April. Discharge.	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Discharge.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.	September. Gauge height.	September. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·9	1·7	1·1	6·0	1·0	3·5			0·9	1·7
2			0·9	1·7	1·1	6·0	1·0	3·5			0·9	1·7
3			0·9	1·7	1·1	6·0	1·0	3·5			0·9	1·7
4			0·9	1·7	1·1	6·0	1·1	6·0			0·9	1·7
5			0·9	1·7	1·1	6·0	1·1	6·0				
6			0·9	1·7	1·1	6·0						
7			1·0	3·5	1·1	6·0						
8			1·1	6·0	1·1	6·0						
9			1·1	6·0	1·1	6·0						
10			1·1	6·0	1·1	6·0						
11			1·1	6·0	1·0	3·5						
12			1·1	6·0	1·0	3·5						
13			1·2	8·8	1·0	3·5						
14			1·2	8·8	1·0	3·5						
15			1·2	8·8	1·0	3·5						
16			1·2	8·8	1·0	3·5						
17			1·2	8·8	1·0	3·5						
18			1·2	8·8	1·0	3·5						
19			1·2	8·8	1·0	3·5						
20			1·1	6·0	1·0	3·5						
21			1·2	8·8	1·0	3·5			0·9	1·7		
22	0·8	0·4	1·2	8·8	1·0	3·5			0·9	1·7		
23	0·8	0·4	1·2	8·8	1·0	3·5			0·9	1·7		
24	0·8	0·4	1·2	8·8	0·9	1·7			0·9	1·7		
25	0·8	0·4	1·2	8·8	0·9	1·7			0·9	1·7		
26	0·8	0·4	1·2	8·8	0·9	1·7			0·9	1·7		
27	0·8	0·4	1·1	6·0	0·9	1·7			0·9	1·7		
28	0·8	0·4	1·1	6·0	0·9	1·7			0·9	1·7		
29	0·9	1·7	1·1	6·0	0·9	1·7			0·9	1·7		
30	0·9	1·7	1·1	6·0	0·9	1·7			0·9	1·7		
31			1·1	6·0					0·9	1·7		

MONTHLY DISCHARGE of Cornwall Creek, four miles from Mouth, for 1912.

(Drainage area, 35 square miles.)

Month.	Discharge in Second-Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Run-Off. Depth in inches on Drainage area.	Total in acre-feet.	Rainfall. Inches.
May	8·8	1·7	6·3	0·18	0·2	387	
June	6·0	1·7	3·9	0·1	0·1	232	
The period							

NOTE.—Accuracy, "A" and "B."

Criss Creek (224.)

Criss creek has its source in the hills between the head-waters of Deadman and Tranquille rivers, at an elevation of 6,000 feet, and discharges into Deadman river, 10 miles above the mouth, at an elevation of 1,500 feet. It is part of the Thompson-Fraser drainage; the drainage area, as measured from a Geological Survey map, dated 1895, scale 2 miles to an inch, is 150 square miles. The creek flows swiftly along a narrow valley, through a rough, hilly country. The water is used for irrigation purposes, but it is only recently that the valley has become settled. There is a road for a few miles up the valley, but beyond that it is merely a pack trail. There is a quantity of small timber, which is of value to conserve the moisture and prevent erosion. Red lakes are on the south branch.

The river station on Criss creek was established June 14, 1912, by C. G. Cline. The measuring section is located about half a mile from the mouth and 400 yards above the highway bridge. Wading measurements are made at low and medium water, and at very high water cable measurements are made from the highway bridge. A standard vertical staff gauge is located on the right bank at the measuring section, and its datum is referred to three bench-marks. The measuring section is excellent; the control is good, the current uniform, the banks high, and there is one channel with a permanent bed.

Discharge Measurements of Criss Creek, near mouth, 1912.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 14	Cline and Corbould	1046	21	47·6	2·2	1·09	107
July 16	B. Corbould	1044	24	31·4	1·2	0·7	38
Aug. 5	"	1044	24	28·6	1·15	0·62	33
Aug. 30	"	1044	22	29·2	1·04	0·6	30

DAILY GAUGE HEIGHT AND DISCHARGE of Criss Creek, near mouth, for 1912.

Day.	June.		July.		August.		September.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·9	68	0·8	52	0·6	30
2			0·85	60	0·8	52	0·65	35
3			0·85	60	0·7	40	0·9	68
4			0·82	55	0·65	35	1·0	88
5			0·8	52	0·6	30	0·9	68
6			0·85	60	0·6	30	0·9	68
7			0·85	60	0·55	26	0·85	60
8			0·85	60	0·5	22	0·8	52
9			0·8	52	0·6	30	0·9	68
10			0·75	46	0·7	40	0·85	60
11			0·75	46	0·7	40	0·8	52
12			0·7	40	0·8	52	0·7	40
13			0·8	52	0·7	40	0·8	52
14	1·09	106	0·85	60	0·6	30	0·85	60
15			0·8	52	0·55	26		
16			0·7	40	0·6	30		
17			0·6	30	0·6	30		
18			0·5	22	0·55	26		
19			0·45	19	0·55	26		
20			0·4	16	0·6	30		
21			0·3	11	0·6	30		
22			0·6	30	0·6	30		
23	0·7	40	1·8	280	0·4	16		
24	0·6	30	2·0	334	0·4	16		
25	0·57	28	1·7	254	0·4	16		
26	0·55	26	1·5	203	0·4	16		
27	0·5	22	1·3	154	0·4	16		
28	0·6	30	1·2	130	0·4	16		
29	0·65	35	1·1	108	0·55	26		
30	0·77	48	1·0	88	0·5	22		
31			0·9	68	0·6	30		

MONTHLY DISCHARGE of Criss Creek, near mouth, for 1912.

(Drainage area, 150 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
July	334	11	84·2	0·56	0·65	5,180	
August	52	16	29·7	0·2	0·23	1,830	
The period.							10 to 12

NOTE.—Station established June 14, and maintained during irrigation season only. Accuracy, "A" and "C."

DAIRY CREEK (229.)

Dairy creek has its source in the hills south of Kamloops lake at an elevation of 3,800 feet, and discharges into Cherry creek near the mouth at an elevation of 1,600 feet. It is part of the Cherry-Thompson drainage. The drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 18 square miles; the drainage area above the station is 13 square miles. Dairy creek is a small irrigation stream in the heart of the Dry Belt; the summers are hot and dry, the winters long and very cold (−30° F.); the mean annual precipitation is about 10 inches.

Dairy creek is controlled by dams on two lakes about 4 miles from the source. These dams were built by the British Columbia Fruit Lands Co., and they form part of the latter's Cherry Creek irrigation system (see hydrographic description of Cherry creek). The surplus water during the freshet is stored in an artificial lake, about 3 miles from the mouth of the Creek, by the Beaton interests.

The river station on Dairy creek was established April 21, 1912, by H. J. E. Keys. The measuring section is located about 100 feet above the new channel made by the British Columbia Fruit Lands Co., just below the gauge. A standard vertical staff gauge (fir) 4 inches by 2 inches by 4 feet 5 inches is used, and all measurements are made by wading. The measuring section is excellent, there being one permanent channel, good banks, and a uniform current. The datum of the gauge is referred to three bench-marks.

DISCHARGE MEASUREMENTS of Dairy Creek, six miles south of Kamloops Lake, 1912.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
April 25	H. J. E. Keys	1057	4·3	2·4	0·41	0·8	1·0
May 18	" "	1057	3·5	4·7	3·0	1·4	14·2
June 26	" "	1057	4·0	2·2	0·6	0·85	1·3

GAUGE HEIGHTS AND DAILY DISCHARGE of Dairy Creek, six miles south of Kamloops Lake, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge.	Gauge height.	Discharge	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1..			1·5	17·4		8·9	0·9	2·1	0·85	1·5		1·7
2.				17·4		7·9		2·1		1·5		1·9
3.				17·4		6·9		2·1		1·5	0·9	2·1
4..				17·4	1·1	5·9	0·9	2·1	0·85	1·5		2·1
5..				17·4		5·2		2·3		1·5		2·1
6..				17·4		4·5		2·5		1·5		2·1
7..				17·4	1·0	3·8		2·7		1·5	0·9	2·1
8.				17·4		3·8	0·95	3·0		1·5		2·0
9..				17·4		3·8		2·5	0·85	1·5		1·8
10.			1·5	17·4	1·0	3·8	0·9	2·1		1·3		1·6
11			1·5	17·4		3·8		2·1		1·2	0·85	1·5
12 .				16·3		3·8		2·1		1·1		
13..				15·1		3·8		2·1		0·9		
14..				14·0		3·8		2·1	0·8	0·8		
15 .			1·35	12·8	1·0	3·8	0·9	2·1		1·1		
16..				13·3		3·4		2·0	0·85	1·5		
17..				13·8		3·0		1·8		1·6		
18..			1·4	14·3		2·6		1·6		1·7		
19..				14·3	0·9	2·1	0·85	1·5		1·8		
20.			1·4	14·3		2·1		1·6		1·9		
21..				13·5		2·1		1·7		2·0		
22..				12·8	0·9	2·1		1·8	0·9	2·1		
23..				12·0		1·9		1·9		1·4		
24...			1·3	11·3		1·8		2·0	0·8	0·8		
25..				11·0		1·7	0·9	2·1		1·0		
26..				10·6	0·85	1·5		2·1		1·2		
27..				10·2		1·8	0·9	2·1		1·4		
28...	1·2	8·4	1·25	9·9	0·9	2·1		1·8	0·85	1·5		
29..		11·4		9·9		2·1	0·85	1·5		. 5		
30..		14·4		9·9		2·1		1·5		1·5		
31.			1·25	9·9				1·5	0·85	1·5		

MONTHLY DISCHARGE of Dairy Creek, six miles south of Kamloops Lake, for 1912.

(Drainage area, 13 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	17·4	9·9	14·2	1·1	1·27	873	
June	8·9	1·5	3·5	0·27	0·30	208	
July	3·0	1·5	2·0	0·15	0·17	123	
August	2·1	0·8	1·4	0·11	0·13	86	
The period							10

NOTE.—Accuracy, "C."

DEADMAN RIVER.

Deadman river has its source in the plateau south of Bonaparte lake, at an elevation of 4,000 feet. It discharges into Thompson river near Savona, at an elevation of 1,100 feet. Criss creek enters from the east, and Barricade, Gorge and Tobacco creeks from the west. The drainage area is 480 square miles above the mouth, 450 square miles above the gauge, and 330 square miles above Criss creek.

Deadman river is in the Dry Belt. The mean annual rainfall is about 10 inches. The summers are hot and dry, the winters cold and dry.

The water of the Deadman is used for irrigation. Some of it is used on two ranches 10 miles or more from the mouth; the Indians use some on their reserve; but three irrigation companies, Smith-Curtis, Savona Orchards Company, and the Barnes Estate, take most of it.

The Smith-Curtis intake on Deadman river is about 3 miles from the mouth. A timber-cribbed dam, 30 feet long and 7 feet high, has been constructed across the stream. The intake is on the east side of the dam, and the flume follows down the east side of the river for 100 yards, then crosses by a substantial bridge. About 400 yards further on, a canyon is reached, which is traversed by a wooden trestle 40 feet high.

The capacity of the Smith-Curtis main canal is about 11 cubic feet per second. It is 2·5 feet wide and 20 inches high. It is a timber flume, caulked and tarred. By this irrigation system part of the Deadman Indian Reserve, part of section 5, township 21-21-6, part of section 32 township 20-21-6, and part of the old townsite of Savona Ferry are irrigated by Smith-Curtis.

The main canal of the Barnes Estates is 10 miles long from the intake to the easterly boundary of the estate. In this there are 7½ miles of flume and 2½ miles of ditch. The main flume is 6 feet wide and 4 feet deep and will carry 3 feet of water. It is made of 1¾-inch boards, well seasoned; the sides and bottom are shiplapped, and the seams are caulked with oakum, and the whole interior coated with tar, making a very permanent and water-tight construction.

The slope of the main flume is 5 feet to the mile, the velocity is 3·8 feet per second, and the capacity is 70 c.f.s.

The main ditch is slightly larger than the flume; the gravelly subsoil is porous, and to prevent losses, is puddled with silt and a little concrete.

The distribution system is rather elaborate, and is not described here.

In order to conduct water from the main Barnes canal across Thompson river to the British Columbia Horticultural Estates at Walhachin, a 12-inch wooden stave syphon has been suspended by cable across the river. The water drops 500 feet from the main canal, crosses the river through the suspended pipe and rises 400 feet on the south side. Five cubic feet per second are thus brought across the river to irrigate about 500 acres of orchard.

The Savona Orchards Company obtains its water from the Barnes canal by arrangement with the Barnes Estates.

Just outside the northerly limit of the Railway Belt, Deadman river widens into a lake, called Deadman or Snohoosh lake. This lake is a narrow winding body of water about three miles long, with a superficial area of 3,500 acres. It affords a good reservoir site. The Barnes Estates have constructed a dam at the outlet of the lake to conserve the waters of the spring freshet until they are needed for irrigation in July and August. The dam is timber-cribbed and rock-filled, the timbers being lock-bolted together; it is founded on bed rock, and the base is concrete-lined, with two 24-inch steel pipes laid in concrete. The flow through the dam is controlled by gates in these pipes. The dam is 140 feet long, and 20 feet high, with a width at the base of 56 feet. The capacity of the reservoir is 7,000 acre-feet.

By the time the freshet on Criss creek is over, Deadman lake reservoir is full and the surplus water usually provides the irrigation supply for a week or so without opening the gates of the dam. So the company is able to start the dry part of the irrigation season with a full reservoir. There are other lakes which could be used for storage if necessary, and it seems probable that there will always be sufficient water for all the land that can be irrigated from Deadman river.

The Deadman country is rough and broken but not really mountainous. The numerous roads and trails which traverse it are evidence of this. The head-waters of the stream are in the southern part of Bonaparte plateau. The elevation at the mouth of the Deadman is 1,100 feet; at Criss creek, 10 miles from the mouth, 1,500 feet; at Deadman lake, 20 miles from the mouth, 2,750 feet. Several of the lakes at the head-waters are at about 4,500 feet.

The main gauging station (221) on Deadman river is at the Williams ranch, below the mouth of Criss creek and above the Walhachin intake. It thus measures practically the whole flow of the stream. It was established on July 11, 1911, and gauge readings were taken daily during the irrigation season of 1911 and 1912. There is a staff gauge nailed to a tree on the right bank of the river and it is referred to three bench-marks. During very high water it is hard to read the gauge closely on account of the unsteadiness of the water. The measurements were made by wading at a point 150 feet below the gauge, as the water is deeper there and not so swift. There is a straight stretch of 150 feet, above the measuring section, mostly riffles. There is a deep hole below the section. The right bank is a gravel bar rising to a height of five feet, some distance from the water. The left bank is five feet high, and covered with bushes. There is only one channel at the gauge, but it is claimed that there is considerable underground flow.

A station (223) was established about 4 miles below the main station to give the unused water, and by subtraction, the amount of water in the Walhachin flume. The station showed that there was always plenty of water, on account of the underground flow past the intake, and was of no other use. So readings were discontinued there and a gauge put in the flume (222) instead. Readings were taken on the flume gauge during the irrigation season of 1912.

DISCHARGE MEASUREMENTS of Deadman River, above Walhachin Intake, for 1911-12

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
July 11......	C. G. Cline.	1046	32	48	2·0	2·06	98
Sept. 23	K. Smith.	1046	21	21	0·75	1·26	15·8
1912.							
May 4........	C. G. Cline...	1046	40	71	2·8	2·75	203
June 16	Cline and Corbould	1046	30	43	3·1	2·45	132
July 16	B. Corbould....	1044	26	34	1·4	1·9	48
Aug. 5	"	1044	26	25·4	1·7	1·83	44
Aug. 30	"	1044	25	28·4	1·4	1·81	42

Daily Gauge Height and Discharge of Deadman River, above Walhachin Intake, for 1911.

Day.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.	September. Gauge height.	September. Discharge.
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·65	33	1·1	11
2			1·65	33	1·1	11
3			1·65	33	1·1	11
4			1·65	33	1·1	
5			1·65	33	1·15	
6			1·75	39		
7			1·75	39		
8			1·7	36		
9			1·7	36		
10			1·7	36		
11	2·1	67	1·7	36		
12	1·9	49	1·65	33		
13	1·7	36	1·65	33		
14	1·6	31	1·6	31		
15	1·5	26	1·6	31		
16	1·4	22	1·55	28		
17	1·4	22	1·5	26		
18	1·35	20	1·45	24		
19	1·3	18	1·4	22		
20	1·2	14	1·4	22		
21	1·2	14	1·3	18		
22	1·2	14	1·3	18		
23	1·2	14	1·25	16		
24	1·4		1·2	14		
25	1·5		1·2	14		
26	1·55	[illegible]	[illegible]	14		
27	1·6	31		14		
28	1·6	31		11		
29	1·6	31	[illegible]	11		
30	1·65	33	1·15	12		
31	1·65	33	1·15	12		

Monthly Discharge of Deadman River, above Walhachin Intake, for 1911.

(Drainage area, 450 square miles.)

Month.	Discharge in Second-feet. Maximum	Minimum	Mean	Per sq. mile.	Run-Off. Depth in inches on Drainage area.	Total in acre-feet.	Rainfall. Inches
July	67	14	27·7	0·06	0·07	1,703	
August	39	11	25·5	0·06	0·07	1,570	
The period							10

Note. The station was abandoned for the season of 1911 at the close of the irrigation season. Winter conditions exist during December, January and February.

Accuracy, "D" in July; "A" in August.

DAILY GAUGE HEIGHT AND DISCHARGE of Deadman River, above Walhachin Intake, for 1912.

Day.	May.		June.		July.		August.		September.	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Guage height	Discharge	Guage height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft
1			2·9	238	2·2	80	2·1	67	1·85	45
2			2·9	238	2·3	98	2·2	80		70
3			2·85	226	2·3	98	2·0	57		95
4			2·7	190	2·3	98	1·85	45	2·4	120
5	2·75	201	2·6	166	2·2	80	1·85	45		100
6	2·9	238	2·55	154	2·2	80	1·8	42	2·2	80
7.	3·3	329	2·5	143	2·3	98	1·8	42		74
8	4·0	492	2·45	132	2·2	80	1·8	42	2·1	67
9	4·4	584	2·4	120	2·15	74	1·8	42		
10	4·3	561	2·5	143	2·1	67	1·85	45		
11	4·4	584	2·3	98	2·0	57		45		
12	4·5	608	2·3	98	2·0	57	1·85	45		
13.	4·6	631		94	2·1	67	[illegible]	49		
14	4·5	608		90	2·1	67		49		
15.	4·3	561		85	2·0	57	[illegible]	49		
16.	4·3	561	2·2	80	1·9	49	[illegible]	53		
17	4·0	492	2·15	74	1·8	42	1·95	53		
18	3·8	445	2·1	67	1·75	39	1·9	49		
19	3·75	434	2·05	62	1·7	36	1·9	49		
20.	3·7	422	2·05	62	1·65	34		48		
21.	4·0	492	2·05	62	1·7	36		46		
22.	4·1	515	2·0	57	1·75	39	1·85	45		
23.	4·0	492	2·0	57	2·5	143	1·75	39		
24	3·9	468	2·0	57	3·5	376		37		
25.	3·8	445	2·0	57	3·2	306	1·7	36		
26	3·7	422	2·0	57	2·9	238		36		
27.	3·55	387	2·0	57	2·7	190	1·7	36		
28.	3·3	329	2·1	67	2·4	120	1·7	36		
29.	3·15	294	2·15	74	2·25	89		39		
30.	3·0	260	2·2	80	2·15	74	1·8	42		
31.	2·9	238			2·1	67	1·85	45		

MONTHLY DISCHARGE of Deadman River, above Walhachin Intake, for 1912.

(Drainage area, 450 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	631	201	448	1·0	1·2	27,550	
June	238	57	106	0·24	0·27	6,310	
July	376	34	98	0·22	0·25	6,030	
August	80	36	46	0·1	0·11	2,850	
The period				[illegible]			

NOTE.—Station maintained during irrigation season only. Winter conditions exist during December, January and February.
Accuracy "A" and "C."

DISCHARGE MEASUREMENTS of Deadman River, Three Miles From Mouth, 1911.

Date.	Hydrographer	Meter No	Width	Area of section	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet	Sec.-ft
July 12	C. G. Cline	1046	36	60	1·1	1·22	66
Sept. 23	Cline & Smith	1016	23	31	0·7	0·71	21
Oct. 4	" "	1046	24	26	0·6	0·57	15·3

DAILY GAUGE HEIGHT AND DISCHARGE of Deadman River, Three Miles from Mouth, for 1911.

Day	July.		August.		September.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·85	32	0·45	13
2			0·85	32	0·45	13
3			0·85	32	0·45	13
4			0·85	32	0·15	13
5			0·85	32	0·[illegible]	17
6			0·9	36		
7			0·9	36		
8			0·9	36		
9			0·9	36		
10			0·9	36		
11			0·9	36		
12	1·1	54	0·85	32		
13	1·0	45	0·8	28		
14	0·85	32	0·8	28		
15	0·75	25	0·8	28		
16	0·7	22	0·7	22		
17	0·65	20	0·6	17		
18	0·6	17	0·55	16		
19	0·5	14	0·55	16		
20	0·5	14	0·55	16		
21	0·5	14	0·5	14		
22	0·5	14	0·5	14		
23	0·5	14	0·5	14		
24	0·55	16	0·5	14		
25	0·55	16	0·5	14		
26	0·55	16	0·5	14		
27	0·6	17	0·5	14		
28	0·6	17	0·5	14		
29	0·7	22	0·5	14		
30	0·75	25	0·45	13		
31	0·8	28	0·45	13		

MONTHLY DISCHARGE of Deadman River, Three Miles From Mouth, for 1911.

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
July	54	14	22·1			1,360	
August	36	13	23·6			1,450	
The period						..	10

NOTE.—Station established July 12, and continued until September 5, 1911. The station is below the Walhachin Intake. The drainage area is therefore not a function of the run-off.
Accuracy, "A."

DISCHARGE MEASUREMENTS of Deadman River, in Walhachin Flume, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
July 13	B. Corbould	1044	6·2	6·8	2·4	1·1	16·6
Aug. 6	"	1044	5·8	6·9	3·2	1·3	22·4
Aug. 31	"	1044	5·8	3·4	2·3	0·62	7·9

DAILY GAUGE HEIGHT AND DISCHARGE of Deadman River in Walhachin Flume, Two Miles from Intake, for 1912.

Day.	July.		August.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·4	25·4
2			1·4	25·4
3			1·4	25·4
4			1·35	23·9
5			1·3	22·4
6			1·3	22·4
7			1·3	22·4
8			1·3	22·4
9			1·3	22·4
10			1·3	22·4
11			1·3	22·4
12			1·3	22·4
13			1·3	22·4
14	....	....	1·3	22·4
15	1·1	16·6	1·3	22·4
16	1·1	16·6	1·3	22·4
17	1·2	19·4	1·3	22·4
18	1·1	16·6	1·3	22·4
19	1·1	16·6	1·3	22·4
20	1·3	22·4	1·3	22·4
21	1·3	22·4	1·2	19·4
22	1·4	25·4	1·2	19·4
23	1·3	22·4	1·2	19·4
24	1·2	19·4	1·1	16·6
25	1·2	19·4	1·1	16·6
26	1·3	22·4	0·0	0·0
27	1·4	25·4	0·0	0·0
28	1·4	25·4	0·0	0·0
29	1·4	25·4	....	....
30	1·4	25·4	....	....
31	1·4	25·4	0·62	7·9

DUFFY CREEK (228.)

Duffy creek has its source in the range hills south of Kamloops lake, at an elevation of 4,000 feet, and discharges into Kamloops lake just west of Cherry at an elevation of 1,120 feet. It is part of the Thompson drainage; its drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 17 square miles: of this, 10 square miles is above the station. Duffy creek is a small irrigation stream of little importance; situated in the heart of the Dry Belt, the creek only runs in the spring. The summers are hot and dry; the winters long and cold; the precipitation is about 10 inches. There are good storage possibilities on the lakes at the head-waters of the creek; but the drainage area is so small that there is a very small run-off, so much so that during 1912, an exceptionally wet season, the maximum flow was only a fraction of a second-foot; the lakes did not fill up to the outlet. This was probably due to the very dry years previous to 1912, when the lakes dried up completely.

During the freshet of 1912, the Beaton storage reservoir, where water from Dairy creek is stored, collapsed. The water swept down the Duffy creek channel to Kamloops lake, carrying away a large section of the C.P.R. road-bed.

A river station was established on Duffy creek, April 26, 1912, by H. J. Keys, above all diversions. A standard vertical staff gauge is located about 50 feet above the highest diversion, its datum being referred to two bench-marks. Only one measurement was made, giving a discharge of one-tenth of a second-foot. The creek has good banks and one channel, with a permanent bed; but the stream is badly choked with logs.

Eagle River (312.)

Eagle river is a stream 40 miles long, rising in Victor and Summit lakes (township 23-3-6)) at Clanwilliam, at an elevation of about 2,200 feet flowing west into Shuswap lake, near Sicamous, B.C., at an elevation of 1,150 feet. Near the mouth the river is sluggish, about 150 feet wide and from 5 feet to 15 feet deep. Above Yard creek (10 miles from the mouth) the river becomes swift and falls about 1,000 feet in the 30 miles from Eagle pass.

The precipitation varies from 26 inches at the mouth to 100 inches at the source. The winter conditions are not severe, but the snowfall is very great near the source (120 inches). The river freezes from two to three months during the winter.

At Taft and Three Valley the Dominion Sawmills, Ltd., have mills, and logs are driven down the river from the various limits.

On the river itself there are no power developments, but the Dominion Sawmills at Taft utilize Crazy creek to develop power for lighting purposes. There are possibilities for small power on the stream, for which storage could be obtained in Three Valley lake and at the source in Victor and Clanwilliam lakes. To the latter the drainage area is very small. The C.P.R. running along the river prevents any large development.

A regular gauging station was established on Eagle river at the C.P.R. bridge, three-quarters of a mile from Sicamous. The gauge is a vertical staff 15 feet long fastened to the piling beneath the bridge. Measurements are made from the bridge. During extreme high water on Shuswap lake there is a tendency toward back-water at the gauge.

Discharge Measurements of Eagle River, near Sicamous, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft
Aug. 23..	.. C. E. Richardson	1048	130	600	1·8	4·42	1,075
Oct. 10..	" "	1048	133	450	1·4	3·15	618
1912.							
Feb. 29	.. C. E. Richardson	1047	118	341	0·7	2·07	253
May 21	H. C. Hughes...	1055	212	1,746	3·1	10·01	5,340
June 17	. C. E. Richardson	1048	200	1,700	3·1	10·06	5,200
July 12	" "	1048	202	1,050	2·0	6·95	2,100
Sept. 7	" "	1049	136	675	2·0	4·5	1,362
Oct. 5	" "	1055	133	497	1·7	3·55	870

DAILY GAUGE HEIGHT AND DISCHARGE of Eagle River, near Sicamous, for 1911.

Day.	August. Gauge height.	August. Discharge	September. Gauge height	September. Discharge	October. Gauge height.	October. Discharge	November. Gauge height.	November. Discharge	December. Gauge height.	December. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				1,052		818		452		632
2			4·2	1,052	3·4	764		446	3·0	620
3				1,066		737	2·5	440		620
4			4·27	1,080		710		458	3·0	620
5				1,022		683	2·6	476		620
6				965	3·1	656	2·55	458		620
7			3·8	908		638		452	3·0	620
8				857	3·0	620		446		656
9			3·52	807		647	2·5	440	3·2	692
10				803	3·15	674		440		680
11			3·5	800		647	2·5	440		668
12				958	3·0	620		476	3·1	656
13				1,116		674	2·7	512		656
14			4·8	1,274		728		572	3·1	656
15				1,212	3·45	782		632		656
16				1,150		737	3·2	692	3·1	656
17			4·3	1,088	3·2	692		674		620
18				1,007		656	3·1	656	2·9	584
19			3·85	926	3·0	620		656		530
20				908		608		656	2·6	476
21			3·75	890		596		656		488
22				880	2·9	584	3·1	656		500
23	4·4	1,124		870		572		656	2·7	512
24			3·67	861		560		656		500
25	4·2	1,052		813	2·8	548	3·1	656		488
26			3·4	764		530		656	2·6	476
27	4·1	1,016		746	2·7	512	3·1	656		476
28			3·3	728		494		656	2·6	476
29	4·0	980		800	2·6	476	3·1	656		464
30			3·7	872		467		644		452
31	4·2	1,052			2·55	458			2·5	440

MONTHLY DISCHARGE of Eagle River, near Sicamous, for 1911.
(Drainage area, 460 square miles.)

Month.	Discharge in Second-Feet. Maximum	Minimum	Mean.	Per sq. mile.	Run-Off. Depth in inches on Drainage area.	Total in acre-feet.	Rain-fall. Inches.
September.	1,274	728	942	2·05	2·29	56,000	
October.	818	458	629	1·37	1·58	38,700	
November	692	440	567	1·23	1·37	33,700	
December	692	440	575	1·25	1·44	35,400	
The period							60

NOTE.—During the month of December partial ice conditions prevailed. Since the discharges given are derived from a curve applicable only to conditions of open flow, the figures given for this month are probably slightly in excess of their true values.

Accuracy, "A," except in December, when it was "C."

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1...	......	450	....	572	2·3	368	....	476	....	1,590	....	4,093
2..	......	460	2·8	548	....	363	2·7	512	....	1,603	....	3,957
3...	2·6	476	....	535	....	358	....	584	5·7	1,616	....	3,821
4...	......	485	....	522	....	354	....	656	....	1,654	8·8	3,685
5....	2·65	494	....	508	2·25	350	3·3	728	....	1,692	....	3,668
6....	..	512	2·65	494	....	326	....	728	6·0	1,730	....	3,652
7...	2·75	530	....	536	....	302	....	728	....	2,030	8·75	3,636
8..	.. .	521	....	578	2·05	278	....	728	....	2,331	......	3,847
9..	2·7	512	3·0	620	....	272	3·3	728	....	2,631	......	4,058
10...	......	512	....	620	....	268	....	299	7·95	2,932	......	4,269
11...	....	512	....	620	....	264	....	1,130	....	3,120	9·5	4,480
12...	2·7	512	....	620	2·0	260	4·95	1,331	....	3,308	....	5,020
13...	.....	534	3·0	620	....	260	....	1,374	....	3,496	....	5,560
14....	.....	[illegible]	....	626	....	272	....	1,417	8·8	3,685	10·5	6,100
15...	.....	[illegible]	....	632	2·05	278	....	1,460	....	4,165	....	5,863
16...	2·95	[illegible]	3·05	638	....	270	5·4	1,502	....	4,645	....	5,573
17....	.....	596	....	638	....	261	....	1,495	9·95	5,123	10·07	5,310
18...	.....	590	....	638	......	252	....	1,489	....	5,142	....	5,805
19...	2·9	584	....	638	1·95	243	5·35	1,483	....	5,161	10·6	6,300
20....	.....	554	3·05	638	.. ....	239	....	1,487	.. ..	5,180	....	6,267
21...	.....	522	....	608	. .....	236	....	1,492	10·0	5,200	....	6,233
22...	......	490	....	578	1·92	233	....	1,495	....	5,099	10·55	6,200
23....	2·55	458	2·8	548	....	240	5·4	1,502	. ...	4,998	....	5,765
24....	.....	505	....	507	....	247	....	1,502	9·8	4,897	....	5,331
25....	.... .	549	....	466	....	254	....	1,502	....	5,055	9·8	4,897
26....	2·95	602	....	426	2·0	260	5·4	1,502	....	5,213	....	4,778
27 ...	.....	606	2·35	386	... .	296	....	1,521	....	5,371	....	4,663
28...	....	610	......	332	....	332	....	1,540	10·2	5,530	9·55	4,547
29...	....	615	2·05	278	2·3	368	....	1,559	....	5,097	....	[illegible]
30...	3·0	620	..		.	404	5·6	1,578	....	4,663	....	3,928
31.... ...		596				440			9·3	4,229		

Eagle River, near Sicamous, for 1912.

Day.	July.		August.		September.		October.		November.		December.	
	Gauge height.	Dis-charge	Gauge height	Dis-charge	Gauge height	Dis-charge	Gauge height	Dis-charge	Gauge height	Dis-charge	Gauge height.	Dis-charge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		3,619		1,635		1,225	3·25	710	3·35	746		692
2	8·4	3,310	5·7	1,616		1,268		806		732		683
3		3,252		1,597	4·9	1,312		902		719	3·15	674
4		3,191		1,578		1,262	4·05	948		705		656
5	8·2	3,136		1,559		1,211		962	3·20	692		638
6		3,037	5·5	1,510	4·5	1,160		926		686	3·0	620
7		2,938		1,527		1,217		890		680		606
8		2,840		1,515		1,274	3·65	854	3·15	674		592
9	7·7	2,742	5·4	1,502		1,331		830		678		578
10		2,590		1,492	5·1	1,388		804		682	2·85	566
11		2,440		1,483		1,376	3·45	782		687		560
12	7·1	2,292		1,473		1,363		773	3·20	692		554
13		2,266	5·3	1,461	5·0	1,350		764		704	2·8	548
14		2,210		1,496		1,280		755		716		539
15		2,214		1,528		1,210	3·37	746	3·30	728		530
16	6·95	2,188	5·55	1,559		1,140		916		719		521
17		2,101		1,506	4·25	1,070		1,086		710	2·7	512
18		2,015		1,451		1,013	4·75	1,255		701		512
19	6·45	1,928		1,402		1,016		1,100	3·20	692		512
20		1,911	5·0	1,350		989		946		716	2·7	512
21		1,894		1,382		962		792		800		507
22		1,878		1,414		935	3·05	638	3·65	854		502
23	6·3	1,862	5·25	1,445		908		716		840		498
24		1,869		1,416		881		794		827	2·65	494
25		1,876		1,387		854	3·70	872		813		488
26	6·35	1,884		1,359		827		863	3·50	800		482
27		1,831	4·95	1,331	3·5	800		854		770	2·6	476
28		1,779		1,268		777		845		740		471
29		1,726		1,205		755	3·60	836	3·25	710		466
30	5·85	1,673	4·45	1,142		732		846		701		462
31		1,654		1,182				795			2·55	458

MONTHLY DISCHARGE of Eagle River, near Sicamous, for 1912.

(Drainage area, 460 square miles.)

Month.	Discharge in Second Feet.			Run Off.			Rain-fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	620	450	540	1·17	1·35	33,200	
February	638	278	551	1·20	1·29	31,700	
March	440	233	295	·64	·74	18,100	
April	1,578	476	1,205	2·62	2·92	71 700	
May	5,530	1,590	3,812	8·29	9·56	234,300	
June	6,300	3,636	4,851	10·54	11·75	288,600	
July	3,619	1,654	2,328	5·06	5·83	143,200	
August	1,655	1,142	1,445	3·14	3·62	88,800	
September	1,388	732	1,097	2·38	2·65	65,000	
October	1,255	638	859	1·87	2·16	52,800	
November	854	671	731	1·59	1·77	43,500	
December	692	458	545	1·18	1·36	33,500	
The period	6,300	233	1,522	3·31	45·00	1,104,400	60 to 70

NOTE.—During the months of January and February partial ice conditions prevailed. Since the discharges given are derived from a curve applicable given for these two months are probably slightly in excess of their true values.

Accuracy: January, February and December, "C"; July, "B"; the remaining months, "A."

EDWARDS CREEK (241.)

Edwards creek has its source in lakes near the head-waters of Sullivan creek, at a probable elevation of 2,800 feet, and discharges into Hefferly creek, 5 miles from the mouth, at an elevation of 2,000 feet. It is part of the Hefferly-Thompson drainage; the drainage area, as measured from the Geological Survey map, dated 1895, scale miles to an inch, is 20 square miles; of this area 15 square miles is above the station. In the upper reaches of the creek the annual precipitation may sometimes be as high as 25 inches; at its mouth the mean annual precipitation is probably from 10 to 12 inches.

Edwards creek, locally known as the north fork of Hefferly creek, is a small irrigation stream about 8 miles long. It drains a country typical of the Hefferly and Louis creek section. There is some large timber on the hills, and practically the whole drainage area is well covered with British Columbia fir, bull pine, jack pine, etc. There is, however, some open country in the valley proper, which affords excellent ranch land, though there is a danger of summer frosts in the upper portions of the creek, owing to the altitude. The creek is about 10 feet wide; during the freshet it has a depth of from 12 to 18 inches, but in the late fall it is practically dry. Two branches join shortly below their sources; good opportunity for storage is offered by two lakes, and this is utilized to a small extent by the local settlers, who have repaired the beaver dams for their own use. There is a small alienating ditch about a mile above the Hydrographic Survey station, which diverts a maximum of one second-foot to the Sullivan valley.

The river station on Edwards creek was established June 21, 1911, by C. G. Cline. The measuring section is located half a mile below the diversion dam, and 10 feet above the foot bridge opposite the Devick house. A standard vertical staff gauge is located at the measuring section and referred to two bench-marks. This is an excellent section; there is a good control, high banks, uniform current, and one permanent channel.

DISCHARGE MEASUREMENTS of Edwards Creek, three miles from mouth, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
June 24	C. G. Cline	1046	5·0	1·5	0·7	0·64	1·16
Aug. 14	"	1046	3·5	1·5	0·4	0·58	0·6
1912.							
May 2	Cline and Dann	1046	9·0	9·4	2·1	1·45	19·7
May 14	E. M. Dann	1044	10	17·2	2·0	2·10	34·5
May 29	"	1044	8·5	7·3	1·85	1·50	13·5
Aug. 20	H. J. F. Keyes	1057	7·5	3·8	1·1	1·01	*4·2

* Different section.

DAILY GAUGE HEIGHT AND DISCHARGE of Edwards Creek, three miles from mouth, for 1911.

Day.	June.		July.		August.		September.		October.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·65	1·0		0·8	0·55	0·7	0·5	0·6
2				0·9		0·8	0·55	0·7	0·5	0·6
3			0·6	0·8		0·8	0·55	0·7	0·5	0·6
4			0·6	0·8		0·8	0·55	0·7	0·5	0·6
5			0·6	0·8		0·8	0·55	0·7	0·5	0·6
6			0·6	0·8		0·8	0·55	0·6	0·5	0·6
7			0·6	0·8		0·8	0·5	0·6	0·5	0·6
8			0·6	0·8	0·6	0·8	0·5	0·6	0·5	0·6
9			0·6	0·8	0·6	0·8	0·5	0·6	0·5	0·6
10			0·7	1·3	0·6	0·8	0·5	0·6	0·5	0·6
11			0·7	1·3	0·6	0·8	0·5	0·6	0·5	0·6
12			0·7	1·3	0·6	0·8	0·5	0·6	0·5	0·6
13			0·7	1·3	0·6	0·8	0·5	0·6	0·5	0·6
14			0·7	1·3	0·6	0·8	0·5	0·6	0·5	0·6
15			0·7	1·3	0·6	0·8	0·5	0·6	0·5	0·6
16				1·2	0·6	0·8	0·5	0·6	0·5	0·6
17			0·65	1·0	0·6	0·8	0·5	0·6	0·5	0·6
18			0·65	1·0	0·6	0·8	0·5	0·6	0·5	0·6
19			0·65	1·0	0·6	0·8	0·5	0·6	0·5	0·6
20			0·65	1·0	0·5	0·8	0·5	0·6	0·5	0·6
21			0·65	1·0	0·5	0·8	0·5	0·6	0·5	0·6
22			0·7	1·3	[illegible]	0·8	0·5	0·6	0·5	0·6
23			0·65	1·0	0·6	0·8	0·5	0·6	0·5	0·6
24	0·65	1·0	0·65	1·9	0·6	0·8	0·5	0·6	0·5	0·6
25	0·65	1·0		1·0	0·55	0·7	0·5	0·6	0·5	0·6
26	0·65	1·0		1·0	0·55	0·7	0·5	0·6	0·5	0·6
27	0·65	1·0		0·9	0·55	0·7	0·5	0·6	0·5	0·6
28	0·6	0·8		0·9	0·55	0·7	0·5	0·6	0·5	0·6
29	0·6	0·8		0·8	0·55	0·7	0·5	0·6	0·5	0·6
30	0·6	0·8	0·6	0·8	0·55	0·7	0·5	0·6	0·5	0·6
31				0·8	0·55	0·7			0·5	0·6

MONTHLY DISCHARGE of Edwards Creek, three miles from mouth, for 1911.

(Drainage area, 15 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain Fall
	Maximum.	Minimum.	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
July	1·3	0·8	1·0	·07	·08	61·	
August	0·8	0·7	0·8	·05	·06	49·	
September	0·7	0·6	0·6	·04	·04	36·	
October	0·6	0·6	0·6	·04	·04	37·	
The period							12

NOTE.—Winter conditions exist from December 1 to April 1, during which time the run-off is very small.

Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Edwards Creek, three miles from mouth, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·92	3·0	1·35	10·0	0·9	2·8	1·0	4·0	1·0	4·0
2			1·35	10·0	1·3	9·0	0·95	3·4	1·0	4·0	1·0	4·0
3			1·4	11·0	1·25	8·0	1·00	4·0	1·0	4·0	1·0	4·0
4			1·4	11·0	1·25	8·0	1·05	4·7	1·0	4·0	1·0	4·0
5			1·42	11·5	1·2	7·0	1·15	6·2	1·0	4·0	1·0	4·0
6			1·52	14·1	1·2	7·0	1·15	6·2	1·0	4·0	1·0	4·0
7			1·67	18·5	1·2	7·0	1·15	6·2	1·0	4·0	1·0	4·0
8			2·05	32·5	1·15	6·2	1·1	5·5	1·0	4·0	1·05	4·7
9			2·3	44·0	1·1	5·5	1·1	5·5	1·0	4·0	1·1	5·5
10			2·17	37·8	1·1	5·5	1·1	5·5	1·0	4·0	1·1	5·5
11			2·05	32·5	1·1	5·5	1·15	5·5	1·0	4·0	1·1	5·5
12			2·07	33·5	1·1	5·5	1·05	4·7	1·0	4·0	1·05	4·7
13			2·1	35·	1·1	5·5	1·05	4·7	1·0	4·0	1·05	4·7
14			2·1	35·	1·1	5·5	1·05	4·7	1·0	4·0	1·0	4·0
15			2·1	35·	1·15	6·2	1·05	4·7	1·0	4·0	1·0	4·0
16			2·1	35·	1·15	6·2	1·0	4·0	1·0	4·0	1·0	4·0
17			2·05	32·5	1·15	6·2	1·0	4·0	1·0	4·0	1·0	4·0
18			2·0	30·	1·1	5·5	1·0	4·0	1·0	4·0	1·0	4·0
19			1·9	26·	1·0	4·0	1·0	4·0	1·0	4·0	1·0	4·0
20			1·85	24·5	1·0	4·0	0·95	3·4	1·0	4·0	1·0	4·0
21	0·4	0·5	1·8	23·0	0·95	3·4	0·95	3·4	1·0	4·0	1·0	4·0
22	0·4	0·5	1·85	24·5	0·95	3·4	1·05	4·7	1·0	4·0		
23	0·45	0·5	1·85	24·5	0·9	2·8	1·15	6·2	1·0	4·0		
24	0·45	0·5	1·85	24·5	0·9	2·8	1·15	6·2	1·0	4·0		
25	0·5	0·6	1·8	23·0	0·85	2·4	1·20	7·0	0·95	3·4		
26	0·55	0·7	1·7	19·4	0·85	2·4	1·20	7·0	0·95	3·4		
27	0·55	0·7	1·6	16·4	0·85	2·4	1·15	6·2	0·95	3·4		
28	0·55	0·7	1·55	15·0	0·9	2·8	1·1	5·5	0·95	3·4		
29	0·65	1·0	1·5	13·5	0·9	2·8	1·05	4·7	0·95	3·4		
30	0·85	2·1	1·4	11·0	0·9	2·8	1·05	4·7	0·95	3·4		
31			1·4	11·0		....	1·05	4·7	0·95	3·4		

MONTHLY DISCHARGE of Edwards Creek, three miles from mouth, for 1912.

(Drainage area, 15 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall.
	Maximum.	Minimum.	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	44.0	3.0	23.1	1.54	1.77	1,420	
June	10.0	2.4	5.2	.35	.39	309	
July	7.0	2.8	5.0	.33	.38	307	
August	4.0	3.4	4.0	.27	.31	246	
September	5.5	4.0	4.0	.27	.30	238	
The period							15

NOTE.—May and June, Accuracy "B", July, August and September, Accuracy "A."

EMERALD RIVER (414).

Emerald river is 5 miles long and rises in Emerald lake at an elevation of 4,400 feet and is a tributary of Kicking Horse river, which it joins near Field, at an elevation of 3,800 feet. It is 15 feet to 25 feet wide and from 1 foot to 3 feet deep. The valley is sloping and heavily timbered. There are no rainfall data available, but the precipitation is probably about 50 inches, of which half is in the form of snowfall. The drainage area is about 21 square miles.

There are no interests on the river. The outstanding feature of this drainage is Emerald lake, which covers an area of about 400 acres and is surrounded by a chain of mountain peaks, Wapta, Field, Burgess, Emerald and Carnarvon. The stream is entirely glacial fed, and the water is a most gorgeous green.

The drainage area is wholly within the Yoho National Park and a beautiful road known as 'Snow Peak Avenue' has been built from Field to the lake. Thousands of tourists annually take this drive and stop at the C.P.R. chalet situated at the foot of the lake facing the Wapta glacier and ice fields.

A gauging station was established on June 5, 1912, by C. E. Richardson, and miscellaneous measurements of the flow made during the season, but no regular gauge readings were taken. The gauge is a standard vertical staff 5½ feet long and is fastened to the left abutment on the downstream side of the bridge, from the upstream side of which measurements are made at high water. In low water, measurements are made by wading. The stream is confined to one channel, and at the measuring section the total flow passes between the bridge abutments. Three bench-marks were located and referred to the gauge datum.

DISCHARGE MEASUREMENTS of Emerald River, near Field, B.C., 1912.

Date	Hydrographer.	Meter No	Width	Area of section	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
June 5	C. E. Richardson	1048	22	24	2·1	2·01	49·6
June 28	"	1018	36	62	3·93	2·92	*237
July 1	"	1048	36	44·6	3·24	2·50	144
Aug. 5	"	1018	36	46·4	3·37	2·58	156
Aug. 14	"	1042	36	32·	3·3	2·31	106
Oct. 2	"	1048	18	19	1·65	1·85	31·3

Estimated minimum discharge during the winter, 5 second-feet.
*Approximate maximum.

ESSELL CREEK (307).

Essell creek, locally known as Summit Lake creek, has its source in Summit lake near the divide between Monte creek and Grand Prairie, at an elevation of 2,050 feet, and discharges into Salmon river near Grand Prairie at an elevation of 1,800 feet. Its drainage area is a little over 6 square miles, and its natural run-off is very small. A diversion has, however, been made from Monte creek to Summit lake by a ditch about a mile long, and it is this Monte creek water which provides the greater part of the flow of Essell creek. This water is used for irrigation around Grand Prairie, where there are over 5,000 acres of land under cultivation. The precipitation in the Essell creek drainage area is from 12 inches to 15 inches, and the evaporation losses from Summit lake are great.

The station was established on May 25, 1911, by C. E. Richardson, and daily gauge readings were taken to September 30, 1911, when the creek went dry. Continuous gauge readings commencing April 13, 1912, were taken to the close of the irrigation season.

The measuring section is 100 yards from the highway from Grand Prairie to Ducks, two miles from Grand Prairie, and 50 yards above the gauge.

The gauge is a vertical staff gauge 5 feet long. Measurements are made with wading equipment from two planks thrown across the stream.

The banks are gently sloping, with no chance of overflow. The bed of the stream is of sand and gravel. Three bench-marks have been placed at the station, and their elevation referred to the datum of the gauge.

DISCHARGE MEASUREMENTS of Essell Creek, near Grand Prairie, 1911-12.

Date	Hydrographer	Meter No.	Width	Area of section	Mean velocity	Gauge height	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
1911							
May 23	C. G. Cline	1046	[illegible]	12.[illegible]	1.3	1.20	16.2
May 23	W. M. Carlyle	1044	[illegible]	[illegible]	1.7	1.20	19.5
May 25	C. E. Richardson	1048	11.[illegible]	14.[illegible]	1.1	1.21	16.2
June 3		1048	[illegible]	[illegible]	1.8	1.35	24.5
Aug. 24	W. M. Carlyle	1044	9.0	[illegible]	0.7	0.87	2.48
Aug. 24		1044	9.0	[illegible]	0.7	0.87	2.68
1912							
May 10	C. E. Richardson	1048	15	15.4	2.1	1.60	32.7
July 15		1048	10.5	6.2	1.6	1.22	9.8
July 17		1048	12.[illegible]	5.7	1.5	1.18	8.8
Aug. 27		1044	[illegible]	2.8	0.9	0.88	2.6

DAILY GAUGE HEIGHT AND DISCHARGE of Essell Creek, near Grand Prairie, for 1911.

Day.	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Discharge.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.	September. Gauge height.	September. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.30	14.7	1.30	19.7	1.10	12.2	.75	0.3
2			1.40	23.5	1.20	15.9	1.10	12.2	.75	0.3
3			1.40	23.5	1.20	15.9	1.10	12.2	.75	0.3
4			1.40	23.5	1.20	15.9	1.10	12.2	.75	0.3
5			1.42	24.3	1.20	15.9	1.10	12.2	.75	0.3
6			1.42	24.3	1.20	15.9	1.00	8.7	.75	0.3
7			1.41	23.0	1.20	15.9	1.00	8.7	.75	0.3
8			1.40	23.5	1.20	15.9	1.00	8.7	.7	0
9			1.40	23.5	1.20	15.9	1.00	8.7	.7	0
10			1.40	23.5	1.25	17.8	1.00	8.7	.7	0
11			1.40	23.5	1.10	12.2	1.00	8.7	.7	0
12			1.40	23.5	1.10	12.2	1.00	8.7	.7	0
13			1.45	25.4	1.10	12.2	1.00	8.7	.7	0
14			1.45	25.4	1.12	12.9	.95	7.0	.7	0
15			1.42	24.3	1.15	14.0	.95	7.0	.7	0
16			1.40	23.5	1.14	13.6	.95	7.0	.7	0
17			1.40	23.5	1.15	14.0	.95	7.0	.7	0
18			1.40	23.5	1.15	14.0	.95	7.0	.7	0
19			1.40	23.5	1.12	12.9	.95	7.0	.7	0
20			1.40	23.5	1.10	12.2	.95	7.0	.7	0
21			1.40	23.5	1.12	12.9	.95	7.0	.7	0
22			1.35	21.6	1.10	12.2	.90	5.2	.7	0
23			1.35	21.6	1.22	16.7	.90	5.2	.7	0
24			1.30	19.7	1.20	15.9	.90	5.2	.7	0
25	1.30	19.7	1.30	19.7	1.20	15.9	.90	5.2	.7	0
26	1.30	19.7	1.30	19.7	1.18	15.2	.80	2.0	.7	0
27	1.30	19.7	1.30	19.7	1.18	15.2	.80	2.0	.7	0
28	1.30	19.7	1.30	19.7	1.15	14.0	.80	2.0	.7	0
29	1.30	19.7	1.28	18.3	1.15	14.0	.80	2.0	.7	0
30	1.30	19.7	1.25	17.8	1.10	12.2	.80	2.0	.7	0
31	1.30	19.7			1.10	12.2	.80	2.0		

MONTHLY DISCHARGE of Essell Creek, near Grand Rapids, for 1911.

(Drainage area, 6 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
June	25	18	22	3·7	4·4	1,309	
July	20	12	15	2·5	2·9	922	
August	12	2	7	1·2	1·4	430	
September	0·3	0	1	01	01	4·5	
The year							

NOTE.—Creek ran dry on September 7. See note on 1912 sheet.
Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of Essell Creek, near Grand Prairie, for 191

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge.	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.
1			1·17	8·2	1·80	32·0	1·37	15·4		5·7		0·5
2			1·20	9·2		31·4	1·37	15·4		5·5		0·6
3			1·20	9·2	1·77	30·8	1·25	10·9		5·4		0·6
4			1·20	9·2	1·75	30·0	1·37	15·[illegible]	0·87	5·3	0·87	[illegible]
5				13·7	1·58	23·2	1·37	15·4		5·1		0·8
6			1·45	18·2	1·68	27·2	1·35	14·6		5·0		0·9
7	Creek	dry.	1·45	18·2	1·68	27·2		13·7	0·90	4·9	0·90	1·0
8			1·50	20·2	1·75	30·0	1·30	12·7		4·7		
9			1·75	30·0	1·72	28·8	1·30	12·7		4·6		
10			1·82	33·0	1·72	28·8	1·27	11·6		4·4		
11			1·87	35·5		28·8	1·27	11·6		4·3		
12				33·0	1·72	28·8	1·27	11·6		4·2	Gauge readings discontinued	
13	0·80	0·0	1·77	30·8		28·6	1·27	11·6		4·0		
14		0·0		30·4		28·3		10·4		3·9		
15		0·0	1·75	50·0	1·70	28·0	1·2	9·2		3·8		
16	0·80	0·0		29·6	1·75	50·0	1·2	9·2		3·6		
17	0·85	0·5		29·2	1·75	30·0	1·17	8·2		3·5		
18		0·5	1·72	28·8	1·75	30·0	1·17	8·2		3·4		
19		0·6		27·4	1·70	28·0	1·17	8·2		3·3		
20		0·6	1·65	26·0	1·65	26·0	1·17	8·2		3·2		
21		0·7		26·0	1·65	26·0	1·15	7·6	1·0	3·1		
22	0·87	0·7	1·65	26·0	1·35	25·0	1·12	6·6		2·7		
23	0·87	0·7		26·9		26·0	1·12	6·6		2·4		
24	0·97	2·5		27·8	1·65	26·0	1·42	17·2	0·95	2·0		
25	0·97	2·5	1·72	28·8		28·0	1·10	6·0		1·7		
26	0·97	2·5		29·4	1·75	30·0	1·05	4·6		1·3		
27	0·95	2·0	1·75	30·0	1·46	18·9	1·05	4·6		0·9		
28	0·95	2·0	1·87	55·5	1·47	18·9		5·3	0·85	0·5		
29	0·95	2·0		33·7	1·45	18·2	1·10	6·0		0·5		
30		5·1	1·80	32·0		16·8	1·10	6·0		0·5		
31			1·80	32·0				5·8	0·85	0·5		

MONTHLY DISCHARGE of Essell Creek, near Grand Prairie, for 1912.

(Drainage area, 6 square miles.)

Month	Discharge in Second-feet				Run-off		Rainfall
	Maximum	Minimum	Mean	Per square mile	Depth in inches on Drainage area	Total in acre-feet	Inches
April	5.1	0	0.8	0.13	0.14	48	
May	35.5	8.2	25.7	4.3	5.0	1,580	
June	32	16.8	27.0	4.5	5.0	1,610	
July	17.2	4.6	10.0	1.7	2.0	615	
August	5.7	0.5	3.4	0.6	0.7	210	
The period							15

NOTE.—In considering run-off it must be borne in mind that the natural flow of the stream is augmented by a diversion from Monte creek to Summit lake. The given figures for run-off per square mile, etc., are therefore larger than they would be under natural conditions.

Accuracy, "B."

FORTUNES CREEK (509).

Fortunes creek, often called Davis creek, is a stream about 15 miles long, rising in the hills about 3 miles northeast of Armstrong at an elevation of 3,500 feet, and discharging into Shuswap river, near Enderby, B.C., in township 18, range 9, west 6th meridian. It is part of the Shuswap-Thompson drainage.

The mean annual precipitation in Fortunes creek drainage is about 20 inches. The snowfall is about 6 feet. Very little irrigation is necessary. The maximum temperature is about 100° F., and the minimum about −25° F.

It is from this creek that the city of Armstrong obtains its water supply (200,000 imperial gallons per day), and power to develop its electric light plant. An average peak load of 63 horse-power is obtained with a 510-foot head and very small pondage. Owing to the small flow in the winter the present storage is not satisfactory, and investigations are being made farther up the creek. If sufficient storage is obtained it is intended to use water from this creek for irrigation purposes on land around Armstrong.

A regular gauging station was established on this creek by C. E. Richardson on August 29, 1911, one mile below the intake, for the city of Armstrong water supply, and immediately above the C.P.R. bridge, 1½ miles north of Armstrong. The gauge is a vertical staff, 5 feet long, fastened to the piles beneath the highway bridge. During extreme high water, measurements are made from the C.P.R. bridge, but during other stages by wading. Due to a tendency for the channel to shift in the gauging section the accuracy of the results cannot be too closely relied upon.

DISCHARGE MEASUREMENTS of Fortunes Creek, near Armstrong, B.C., 1911-12.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Aug. 29......	C. E. Richardson......	1048				0·82	4·1
Oct. 9.......	" " ...	1048				0·80	2·4
1912.							
May 21	C. E. Richardson ...	1048	30	39	4·[illegible]	1·76	159
June 15..	" "	1048	52	48	4·6	2·01	219
June 20 ..	" "	1048	22	23	3·8	1·00	86
July 12.	" "	1048	17	13	1·2	0·53	15·6
Sept. 7.	" "	1049	13	7·7	1·8	0·6	13·9
Oct. 5..	" "	1055	6·4	1·5	1·2	0·26	1·8

DAILY GAUGE HEIGHT AND DISCHARGE of Fortunes Creek, near Armstrong, for 1911.

Day.	August.		September.		October.		November.		December.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		...	0·8	2·4	0·8	2·4	0·75	1·7	0·7	1·0
2		...	0·8	2·4	0·8	2·4	0·75	1·7	0·7	1·0
3	...	...	0·85	3·8	0·8	2·4	0·75	1·7	0·7	1·0
4	...	...	0·8	5·1	0·78	2·1	0·78	2·1	0·7	1·0
5			0·85	3·8	0·75	1·7	0·8	2·4	0·68	·8
6			0·82	2·9	0·72	1·3	0·8	2·4	0·65	·7
7			0·9	5·1	0·7	1·0	0·8	2·4	0·65	·7
8			0·9	5·1	0·8	2·4	0·8	2·4	0·65	·7
9			0·88	4·6	0·78	2·1	0·82	2·9	0·72	1·4
10			0·85	3·8	0·75	1·7	0·8	2·4	0·72	1·4
11			0·82	2·9	0·72	1·4	0·8	2·4	0·68	·9
12			0·85	3·8	0·72	1·1	0·8	2·4	0·65	·7
13			1·0	10·2	0·70	1·0	0·8	2·4	0·60	1
14			0·95	7·6	0·9	5·1	0·8	2·4	0·7	1·0
15			0·95	7·6	0·9	5·1	0·8	2·4	0·7	1·0
16			0·95	7·6	0·9	5·1	0·8	2·4	0·7	1·0
17			0·95	7·6	0·88	4·6	0·72	1·3	0·6	·4
18			0·9	5·1	0·88	4·6	0·78	2·1	0·6	·4
19			0·9	5·1	0·85	3·8	0·8	2·4	0·62	·5
20			0·95	7·6	0·8	2·4	0·8	2·4	0·6	·4
21			0·85	3·8	0·8	2·4	0·78	2·1	0·6	·4
22	....		0·9	5·1	0·8	2·4	0·78	2·1	0·6	·4
23			0·85	3·8	0·8	2·4	0·75	1·7	0·6	·4
24			0·88	4·6	0·85	3·8	0·78	2·1	0·6	·4
25			0·85	3·8	0·85	3·8	0·80	2·4	0·6	·4
26			0·82	2·9	0·85	3·8	0·8	2·4	0·6	·4
27			0·88	4·6	0·82	2·9	0·78	2·1	0·6	·4
28			0·8	2·4	0·80	2·4	0·75	1·7	0·60	·4
29	0·8	2·4	0·9	5·1	0·8	2·4	0·7	1·0	0·57	·3
30	0·8	2·4	0·8	2·4	0·82	2·9	0·75	1·7	0·6	·4
31	0·85	3·8	...		0·78	2·1	...	...	0·6	·4

MONTHLY DISCHARGE of Fortunes Creek, Armstrong, for September to December, 1911.

(Drainage area above station, 20 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
September	10·2	2·4	4·7	·24	·27	283	
October	5·1	1·0	2·7	·14	·16	169	
November	2·9	1·0	2·1	·11	·12	127	
December	1·4	·3	·67	·03	·03	40	
The period							18

NOTE.—The above results are deduced from measurements made in 1911 and 1912 by means of curve No. 1. The above figures do not include the 200,000 gallons per day used by the City of Armstrong for water supply, so to the mean monthly discharge must be added 0·5 second-feet.

Accuracy, "B" for September and October; "C" for November and December.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	January.		February.		March		April.		May.		June.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·6	·4	0·7	1·0	0·7	1·0	0·75	1·7	1·0	10·2	1·3	47
2	0·6	·4	0·7	1·0	0·7	1·0	0·78	2·1	1·0	10·2	1·25	39
3	0·6	·4	0·7	1·0	0·7	1·0	0·78	2·1	1·0	10·2	1·08	17·2
4	0·6	·4	0·7	1·0	0·7	1·0	0·8	2·4	1·05	14·6	1·1	19·0
5	0·6	·4	0·68	·9	0·68	·9	0·8	2·4	1·1	19·0	1·05	14·[illegible]
6	0·6	·4	0·68	·9	0·7	1·0	0·8	2·4	1·18	29·0	1·08	17·2
7	0·58	·4	0·65	·7	0·7	1·0	0·8	2·4	1·2	21·0	1·0	10·2
8	0·6	·4	0·7	1·0	0·7	1·0	0·8	2·4	1·22	34·0	1·3	47·0
9	0·7	1·0	0·68	·9	0·75	1·7	0·78	2·1	1·28	44·0	1·4	65·0
10	0·7	1·0	0·68	·9	0·75	1·7	0·8	2·4	1·2	31·0	1·25	39·0
11	0·7	1·0	0·68	·9	0·7	1·0	0·88	1·6	1·25	39·0	1·32	54·[illegible]
12	0·7	1·0	0·68	·9	0·7	1·0	0·8	2·4	1·3	47·0	1·42	69
13	0·7	1·0	0·65	·7	0·7	1·0	0·78	2·1	1·35	56·0	1·58	105
14	0·6	·4	0·7	1·0	0·75	1·7	0·75	1·7	1·5	87·0	1·6	110
15	0·6	·4	0·7	1·0	0·75	1·7	0·75	1·7	1·4	65·0	2·02	229
16	0·58	·4	0·75	1·7	0·78	2·1	0·75	1·7	1·5	87·0	1·5	[illegible]
17	0·5	·2	0·7	1·0	0·75	1·7	0·75	1·7	1·48	82·0	1·3	[illegible]
18	0·5	·2	0·75	1·7	0·75	1·7	0·8	2·4	1·5	87·0	1·2	[illegible]
19	0·5	·2	0·75	1·7	0·7	1·0	0·9	5·1	1·58	105·0	1·08	[illegible]
20	0·5	·2	0·78	2·1	0·7	1·0	0·9	5·1	1·62	115	0·95	73
21	0·5	·2	0·75	1·7	0·7	1·0	0·9	5·1	1·8	164	0·9	[illegible]
22	0·52	·2	0·75	1·7	0·75	1·7	0·95	7·6	1·6	110	0·85	[illegible]
23	0·52	·2	0·75	1·7	0·78	2·1	0·95	7·6	1·7	136	0·8	45
24	0·55	·3	0·78	2·1	0·78	2·1	0·95	7·6	1·8	164	0·7	[illegible]
25	0·55	·3	0·78	2·1	0·75	1·7	1·0	10·2	1·8	161	0·7	[illegible]
26	0·6	·4	0·78	2·1	0·75	1·7	0·98	9·2	2·0	223	0·65	[illegible]
27	0·6	·4	0·7	1·0	0·75	1·7	0·98	9·2	1·9	193	0·6	[illegible]
28	0·6	·4	0·7	1·0	0·7	1·0	0·98	9·2	1·8	164	0·65	[illegible]
29	0·65	·7	0·7	1·0	0·78	2·1	0·98	9·2	1·6	110	0·68	[illegible]
30	0·68	·9			0·75	1·7	1·0	10·2	1·5	87	0·7	[illegible]
31	0·7	1·0		..	0·75	1·7			1·4	65	..	

Fortunes Creek, near Armstrong, for 1912.

July.		August.		September.		October.		November.		December.		Day.
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	
0·75	37·5	0·4	4·9		7·0		1·7	0·25	1·7	0·28	2·1	1
0·78	12·0		7·0	0·48	9·0	0·25	1·7		1·7		2·1	2
0·7	30·0	0·48	9·9		8·2		1·7	0·25	1·7	0·28	2·1	3
0·68	27·6		5·7	0·45	7·4	0·25	1·7		1·7		2·1	4
0·68	18·0	0·3	2·4		8·2		1·7	0·25	1·7	0·28	2·1	5
[illegible]	18·0		2·4	0·48	9·0	0·25	1·7		1·7		1·9	6
0·58	16·4	0·3	2·4		8·2		1·7	0·25	1·7	0·25	1·7	7
0·58	16·4		2·4	0·45	7·4	0·25	1·7	0·28	2·1		1·7	8
0·55	14·0	0·3	2·4		6·6		1·7	0·28	2·1	0·25	1·7	9
0·55	16·4		2·6	0·42	5·9	0·25	1·7		1·9		1·9	10
0·52	11·6	0·32	2·9		5·4		[illegible]		1·9	0·23	2·1	11
0·52	11·6		3·4	0·4	4·9	0·28	2·1	0·25	1·7		2·1	12
0·65	24·0	0·36	3·9		[illegible]		1·9		2·0	0·23	2·1	13
[illegible]	18·0		4·4	0·4	4·9	0·25	1·7	0·3	2·4		1·9	14
	18·0	0·4	4·9		4·6		1·7		2·4	0·25	1·7	15
[illegible]	18·0		7·4	0·38	4·4	0·25	1·7	0·3	2·4		1·7	16
	17·2	0·5	10·0		4·4		3·3		2·4	0·25	1·7	17
[illegible]	16·4		12·0	0·38	4·4	0·4	4·9	0·3	2·4		1·4	18
	16·4	0·55	14·0		3·4		4·9		2·4	0·2	1·0	19
[illegible]	16·4		[illegible]	0·3	2·4	0·4	4·9	0·3	2·4		1·0	20
	17·2	0·5	[illegible]		2·4		4·2		2·4	0·2	1·0	21
[illegible]	18·0		8·7	0·3	2·4	0·35	3·6	0·3	2·4		1·0	22
	18·0	0·45	7·4		2·4		[illegible]		2·2	0·2	1·0	23
	18·0		5·2	0·3	2·4	0·35	3·6	0·28	2·1		1·0	24
	23·0	0·32	2·9		2·6		3·2		2·1	0·2	1·0	25
	28·0		2·6	0·32	2·9	0·32	2·9	0·28	2·1		·8	26
	19·0	0·3	2·4		2·0		2·9		1·9	0·15	·7	27
[illegible]	10·0		2·6	0·2	1·0	0·32	2·9	0·25	1·7		·8	28
	9·5	0·32	2·9		1·4		2·7		1·7	0·2	1·0	29
[illegible]	9·0		3·9	0·25	1·7	0·3	2·4	0·25	1·7		1·0	30
	7·0	0·4	4·9				2·1			0·2	1·0	31

MONTHLY DISCHARGE of Fortunes Creek, near Armstrong, B.C., for 1912.

(Drainage area above station, 20 square miles.)

Month	Discharge in Second-Feet.				Run Off.		Rainfall.
	Maximum	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	1·0	·2	·5	0·02	0·023	31	
February	2·1	·7	1·2	0·06	0·065	69	
March	2·1	·9	1·4	0·07	0·08	86	
April	10·2	1·7	4·5	0·22	0·24	268	
May	223	10·2	83·4	4·20	4·80	5,130	
June	229	10·2	64·0	3·20	3·60	3,810	
July	42	7·0	18·7	0·94	1·10	1,150	
August	14	2·1	5·5	0·24	0·32	338	
September	9·0	1·0	4·7	0·24	0·27	280	
October	4·9	1·7	2·6	0·13	0·15	160	
November	2·4	1·7	2·0	0·10	0·11	119	
December	2·1	0·7	1·5	0·08	0·08	92	
The year	229	0·2	16·8	0·78	10·8	11,533	18

NOTE.—The above results are deduced from measurements made in 1911 and 1912 by means of curve No. 1 up to June 15, and curve No. 2 from June 16 to December 31. The above figures do not include the 200,000 gallons per day used by the city of Armstrong for water supply, so to the mean monthly discharge must be added 0·5 second-foot.

Accuracy, "C" for January, February, June and December; "B" for the remaining months.

FRASER RIVER (101 and 102).

Fraser river has its source in Yellowhead pass at an elevation of 3,710 feet, and after flowing some 700 miles in general southwesterly direction, discharges into the Pacific (Strait of Georgia) near New Westminster. Of its length, the lower 175 miles is within the railway belt. The important tributaries within the belt are Pitt river, Stave river, Sumas river, Harrison river, Nahatlatch (or Salmon) river, Silver-hope creek, Coquihalla river, Steen creek, and Thompson river, the last named being the largest confluent.

The drainage area of Fraser river is about 90,000 square miles. The report on the Water-powers of Canada, issued by the Commission of Conservation, 1911, gives it as 91,700 square miles. The said report also gives an interesting article on the Fraser river in the chapter on British Columbia.

The drainage area of Fraser river above Lytton, (*i.e.*, the mouth of Thompson river) is 63,000 square miles.

The drainage area of Fraser river above the gauging station at Hope (below the mouth of Coquihalla river) is 85,600 square miles.

The Fraser is important for fishing, navigation and lumbering. There are some millions of latent horse-power in the river, particularly in the Fraser canyon, but it is improbable that the river will be harnessed in the near future. A company now has a project for developing power at Hell's Gate, near Yale, where the river runs through a narrow canyon, and the difference between extreme high water and low water is about 100 feet.

Fraser river is the largest stream lying wholly in British Columbia, and it has played a very important part in the development of the province. It was the discovery of gold in the bed of the Fraser river that brought large numbers of men into the country; and it was the gradual movement of the gold seekers up the valley that opened up the country and led to the building of roads and bridges. When the C.P.R. was built it followed the Fraser for 150 miles, and the Thompson, a tributary of the Fraser, for as many more. The C.N.R. follows the Fraser and Thompson to Kamloops, goes up the North Thompson, strikes across the divide to the upper Fraser again and follows it to the Yellowhead pass. The Grand Trunk Pacific follows the Upper Fraser river from Yellowhead pass for 300 miles. And the proposed Pacific Great Eastern will follow the Fraser river for 200 miles or more. Since the railways are the most important factors in developing a country, rich in natural resources, the valleys of the Fraser river and its tributaries will necessarily continue to be of great importance.

Probably the most important industry directly connected with the Fraser river is the fishing. Salmon of various kinds come in from the salt water in countless numbers in the fall and swarm up the Fraser river, heading for the spawning grounds on the smaller rivers and creeks. Great numbers of them are caught near the mouth of the Fraser, and large canneries are situated there; and salmon are caught on all parts of the Fraser and on all the streams that flow into it. In the winter dried fish is the staple diet of the Fraser River Indians.

British Columbia is essentially a mountainous country, and the watershed of the Fraser follows the general rule. As a result, the amount of land suitable for agriculture is relatively small. It is found mostly in small flats and benches along the Fraser and its tributaries; and sometimes a valley will widen out and give a larger expanse of good land, as in the case of the Nicola valley, where there are several townships of good land in a block. Many of the small flats contain excellent land, and some of them in the Dry Belt are well sheltered and make excellent fruit land. But the richest land in the whole province is the delta land near the mouth of the Fraser river, of which Lulu island is a good example.

In the days of the gold rush, before the Canadian Pacific Railway was built, steamers used to run up the Fraser as far as Yale, which is 100 miles from the coast. And during the construction of the Canadian Northern, supplies were distributed by steamer as far as Yale. But, as a rule, navigation on the Fraser is now confined to the fifty-mile stretch from Chilliwack to the mouth. This part of the stream is tidal, and river steamers make regular trips between New Westminster and Chilliwack, calling at many points on both sides of the river on the way. But the construction of railways, and electric lines is rendering the river transportation less important than formerly.

On the other hand, the importance of the Fraser river as a port for ocean shipping is increasing. In the early days, New Westminster was the only port on the mainland, and there was sufficient water over the bar for the ships of those days. But with the coming of the Canadian Pacific Railway to Burrard inlet and the increase in the draught of ocean-going vessels, the Fraser river became of secondary importance. Now, however, jetties are being built at the mouth of the river so that the stream will keep its channel secured clean, and dredging is being done where necessary. In Burrard inlet most of the suitable waterfront is in use, and all of it is held at high prices, while along the Fraser river there are miles of good waterfront lying idle. New Westminster is starting on an extensive harbor improvement programme, and intends to improve the waterfront along the city and to build docks on Annan's island. The Canadian Northern Railway is planning for a town at Port Mann, where for two miles or more there is deep water close to the shore. An industrial city seems to be starting around the Canadian Pacific Railway yards at Coquitlam, and harbour surveys are being made along the Fraser and Pitt rivers. So that it is probable the Fraser will develop into a fresh water harbour of considerable importance.

Lumbering is one of the chief industries of British Columbia, and there is a good deal of timber in the Fraser river watershed. The best timber is near the coast, where fir and cedar grow to immense sizes. But most of the watershed is covered with timber of some kind. In the Dry Belt, the lower benches are often bare, but there are generally trees on the hills. In the mountains there are trees on the lower hills, though the higher peaks may rise above timber line. In the Cariboo district, there has been cut only what timber was required for local use. The same is practically true of the Dry Belt. But at the coast, in addition to supplying the large local demand, a great deal of timber is shipped by rail to the prairie, and by water to Australia, South America and the Orient. The longest sizes of cedar poles are sent by rail, even as far east as Ontario. The logs are floated down to navigable water, where they are made into rafts and towed to the mills. There are several mills on the Fraser river, and one of them is said to be the largest in the world; but a good deal of the timber they use is cut outside the Fraser watershed. Up to the present the timber that has been cut is that in the lower parts of the valleys, where it has been within easy reach of the water. But before long it will be necessary to build logging railroads to the head-waters; and the cutting of the timber there, unless done under careful supervision, with provision for reforestation, will affect the regimen of the streams.

There are no very good power sites on the Fraser river inside the Railway Belt, though many of its tributaries have excellent ones. There are no falls on the river, and no very heavy rapids. There are places in the canyon where 30 or 40 feet of head could be obtained by means of a dam. But there is a railroad on each side of the river, not far above the high water line as it is at present, and it would be found very difficult to take care of the heavy flood discharge in the narrow canyon.

The Fraser river empties into the Gulf of Georgia, and at the mouth it rises and falls with the tides; this tidal influence extends up the river with diminishing effect until it becomes almost negligible at Agassiz, 70 miles from the mouth. The tide rises several feet in Pitt river, and Pitt lake also. Hence, during ordinary stages of the Fraser, there is quite a current upstream past New Westminster when the tide is rising. This is of importance in connection with navigation, water supply and sewage disposal.

At New Westminster the Fraser is a magnificent stream, being more than half a mile in width, with the main channel about 40 feet deep. In addition to the ordinary flow of the stream, there is the ebb and flow of the tidal water. Near Hope, 90 miles from the mouth, the river varies from 700 to 1,000 feet in width, is 40 feet deep, in places, at low water, and at high water rises 20 feet above the low-water mark. The maximum discharge in 1912 was 220,000, the minimum 13,000, and the mean for the year about 70,000 cubic feet per second. At Yale, 100 miles from the mouth, the canyon begins and the river is confined between solid rock walls. In many places it is only two or three hundred feet wide, and varies in depth at low water from 20 to 80 feet. During the flood it sometimes rises in certain confined parts of the canyon as much as 100 feet above the low-water mark. This canyon extends for about 30 miles, and presents a very imposing appearance. Above the canyon the banks are still high, but the rock is not so much in evidence. At Lytton, 150 miles from the mouth, the Thompson river enters; and above the mouth of the Thompson, the Fraser is not so large. It is from 300 to 700 feet wide, 15 feet deep at low water and at high water rises 25 feet above the low-water mark. The maximum discharge for 1912 was 175,000, the minimum, 6,800 and the mean about 50,000 cubic feet per second.

Near Tête Jaune Cache, 50 miles from the summit, the altitude is 2,400 feet. Between that point and Fort George the stream is navigable during high water. The altitude at this latter point is 1,900 feet, a descent of 500 feet in about 200 miles. Near Fort George the Fraser river turns south. Steamers make regular trips on the 120-mile stretch between Fort George and Soda creek. At Lillooet, 130 miles farther south, the elevation is 665 feet. Near Lytton, 40 miles from Lillooet, the mean elevation is about 450 feet. Yale is 53 miles from Lytton and about 100 miles from the gulf of Georgia; the elevation of the water at the average height is 170 feet. At Hope, 13 miles south of Yale, the Fraser begins to turn in a westerly direction; its elevation is about 125 feet. From Agassiz, 19 miles below Hope, the course is almost directly west to the gulf of Georgia. The elevation of the river at Agassiz is about 60 feet. For the last fifty miles from Chilliwack to the mouth the stream is affected more or less by the tides.

Fraser River at Hope (101).

A gauging station was established on Fraser river at Hope on March 1, 1912, by C. G. Cline. This spot was chosen instead of one lower down the river to make sure that there would be no tidal influence, either from the tide itself or its effect on the flood waters of the Fraser.

The station is above the mouth of Coquihalla river, at the rock point below the Hope ferry landing. The measuring section at low and medium stages is at the gauge, and the measurements are made by current meter suspended by a mild steel cable with an insulated core, 30 pounds of lead used. A motor or row-boat is anchored in the river just under the telephone wire above the ferry crossing. The boat is anchored in the true section, and its location is determined by transit from the shore, by means of a measured base and observed angles.

At high water the measurements are made at Yale, 15 miles above Hope, from a cable and car, constructed by the Canadian Northern Railway.

The gauge is painted on the rocky bank on the above-mentioned rock point near the ferry landing, on the left bank. The gauge is graduated in feet, and estimated to tenths, by the gauge reader, Capt. Smith, who runs the motor ferry. The datum of the gauge was referred to three bench-marks.

The minimum flow of the Fraser takes place in the latter part of February or early in March. In 1912, the minimum was 13,000 c.f.s.

The river at the gauging station is 16 feet deep at low water and 35 feet deep at high water.

The section is from 700 to 1,000 feet wide. The mean velocity varies from 1·3 feet per second at low water to about 6 or 7 feet per second at high water. At the high-water section at Yale, the mean velocity at the flood period is about 9 feet per second.

The flood occurs toward the end of June, and lasts for nearly two weeks. The maximum discharge during 1912 occurred on June 24, and was 216,000 c.f.s.

Open channel conditions exist all year.

Discharge Measurements of Fraser River, at Hope, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar. 5	C. G. Cline	1046	690	14,400	1·3	10·0	18,280
June 6	C. G. Cline, B. Corbould	1046	1,000	19,800	6·8	21·0	135,700
June 28	C. G. Cline	1046	710	26,500	8·5	24·5	225,000*
Sept. 24	"	1046	885	17,200	4·0	14·7	69,950
Sept. 26	"	1046	575			14·0	73,400*

* Measured at Yale.

DAILY GAUGE HEIGHT AND DISCHARG

Day.	March.		April.		May.		June.		July.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharg
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-f
1	. . .	15,000	10·2	20,000	14·9	65,000	23·0	182,000	23·3	186,000
2	. . .	15,000	10·7	24,000	15·2	69,000	23·0	182,000	22·0	182,000
3		15,000	10·5	22,000	16·0	79,000	22·7	176,000	22·7	176,000
4		15,000	10·7	24,000	16·7	87,000	22·0	160,000	21·3	154,000
5		15,000	10·7	24,000	17·0	92,000	21·5	158,000	21·9	164,000
6	10·0	18,000	10·7	24,000	17·5	95,000	21·0	150,000	21·1	151,000
7	9·7	15,000	10·9	26,000	17·6	100,000	20·8	146,000	20·9	148,000
8	9·7	15,000	11·0	27,000	18·0	106,000	20·9	148,000	20·9	148,000
9	9·6	15,000	11·1	28,000	18·5	113,000	20·7	144,000	20·8	116,000
10	9·6	15,000	11·2	29,000	18·9	118,000	20·7	141,000	20·8	146,000
11	9·6	15,000	11·2	29,000	19·2	122,000	20·8	116,000	20·5	142,000
12	9·6	15,000	11·5	31,000	19·7	129,000	21·2	152,000	20·0	134,000
13	9·6	15,000	11·6	32,000	19·9	132,000	21·7	160,000	20·2	136,000
14	9·5	14,000	11·7	33,000	19·9	132,000	21·9	161,000	20·2	136,000
15	9·4	14,000	11·9	35,000	20·1	135,000	22·0	166,000	20·3	137,000
16	9·5	14,000	12·0	36,000	21·7	160,000	22·8	178,000	20·8	146,000
17	9·6	15,000	12·7	43,000	21·7	160,000	23·0	182,000	20·5	142,000
18	9·7	15,000	12·5	41,000	22·0	166,000	23·7	192,000	20·1	135,000
19	9·7	15,000	12·7	43,000	23·5	190,000	23·5	190,000	19·9	132,000
20	9·6	15,000	13·0	46,000	23·6	191,000	23·8	194,000	19·8	130,000
21	9·7	15,000	13·2	48,000	23·7	192,000	24·2	200,000	19·7	129,000
22	9·6	15,000	13·5	51,000	23·5	190,000	24·9	212,000	19·6	128,000
23	9·5	14,000	13·8	51,000	22·8	178,000	25·1	215,000	19·7	129,000
24	9·5	14,000	14·0	56,000	23·2	184,000	25·2	216,000	19·5	127,000
25	9·3	13,000	14·0	56,000	24·0	198,000	25·2	216,000	19·7	129,000
26	9·7	15,000	14·1	57,000	24·1	199,000	24·8	210,000	19·8	130,000
27	9·8	16,000	14·5	61,000	24·2	200,000	24·5	207,000	19·8	130,000
28	10·1	19,000	14·7	63,000	24·0	198,000	24·5	207,000	19·5	127,000
29	10·2	20,000	14·8	64,000	24·0	198,000	24·0	198,000	19·1	121,000
30	10·0	18,000	15·0	67,000	23·7	192,000	23·5	190,000	19·0	120,000
31	19·9	17,000		. . . . .	23·5	190,000	. . .	. . . . .	19·1	121,000

of Fraser River, at Hope, for 1912.

August.		September.		October.		November.		December.		Day.
Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
18·9	118,000	17·0	92,000	13·3	49,000	12·6	42,000	11·4	30,000	1
18·8	116,000	16·7	87,000	13·5	51,000	12·5	41,000	11·5	31,000	2
18·8	116,800	16·7	87,000	13·5	51,000	12·4	40,000	11·3	30,000	3
18·9	118,000	16·5	85,000	13·2	48,000	12·2	38,000	11·4	30,000	4
19·1	121,000	16·0	79,000	13·0	46,000	12·1	37,000	11·5	31,000	5
19·1	121,000	15·9	77,000	13·5	51,000	12·0	36,000	11·3	30,000	6
19·0	120,000	15·8	76,000	14·0	56,000	12·2	38,000	11·4	30,000	7
18·9	118,000	15·7	75,000	14·9	65,000	12·1	37,000	11·2	29,000	8
19·0	120,000	15·7	75,000	14·7	59,000	12·2	38,000	11·0	27,000	9
19·1	121,000	15·5	73,000	11·2	58,000	12·2	38,000	11·0	27,000	10
18·9	118,000	15·7	75,000	14·1	57,000	12·1	37,000	11·1	28,000	11
18·9	118,000	15·5	73,000	14·2	58,000	12·0	36,000	11·2	29,000	12
19·0	120,000	15·6	71,000	14·2	58,000	12·8	44,000	11·4	30,000	13
19·5	127,000	15·2	69,000	14·0	56,000	12·4	40,000	11·4	30,000	14
19·5	127,000	14·9	65,000	11·0	56,000	12·2	38,000	11·2	29,000	15
19·3	123,000	15·0	67,000	13·8	54,000	12·2	38,000	11·1	28,000	16
18·7	115,000	15·0	67,000	14·0	56,000	11·9	35,000	10·9	26,000	17
18·5	113,000	15·0	67,000	13·8	54,000	12·1	37,000	10·9	26,000	18
18·5	113,000	11·9	65,000	13·7	53,000	12·9	45,000	10·8	25,000	19
18·7	115,000	14·8	64,000	13·7	53,000	12·4	40,000	10·7	24,000	20
18·7	115,000	14·8	64,000	13·8	54,000	12·2	41,000	10·7	24,000	21
18·7	115,000	14·7	63,000	13·5	51,000	12·5	41,000	10·7	24,000	22
18·7	115,000	14·5	61,000	13·5	51,000	12·8	44,000	10·8	25,000	23
18·9	118,000	14·4	60,000	13·3	49,000	12·7	43,000	10·9	26,000	24
19·1	121,000	14·2	58,000	13·3	49,000	12·4	40,000	10·8	25,000	25
19·7	129,000	14·0	56,000	13·5	49,000	11·9	35,000	11·0	[illegible]	26
19·7	129,000	14·0	56,000	13·0	46,000	11·8	34,000	10·7	24,000	27
19·3	123,000	14·0	56,000	12·8	44,000	11·8	34,000	10·9	26,000	28
18·0	106,000	13·8	54,000	13·0	46,000	11·7	33,000	11·0	27,000	29
17·9	104,000	13·5	51,000	12·9	45,000	11·6	32,000	11·1	28,000	30
17·5	99,000			12·7	43,000			11·2	29,000	31

Monthly Discharge of Fraser River, at Hope, for 1912.

(Drainage area, 85,600 square miles.)

Month.	Discharge in Second-Feet.				Run Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	20,000	13,000	15,355	0·2[illegible]	0·22	944,000
April	67,000	20,000	39,800	0·50	0·60	2,370,000
May	200,000	65,000	147,097	1·70	2·00	9,040,000
June	216,000	144,000	179,700	2·10	2·30	10,700,000
July	186,000	120,000	140,710	1·70	2·00	8,650,000
August	129,000	99,000	118,000	1·40	1·60	7,260,000
September	92,000	51,000	69,035	0·80	0·90	4,100,000
October	65,000	43,000	52,129	0·60	0·70	3,200,000
November	44,000	52,000	38,300	0·40	0·50	2,280,000
December	31,000	24,000	27,581	0·30	0·35	1,695,000

Note.—Accuracy, "B."

FRASER RIVER AND LYTTON (102).

A station was established on Fraser river at Lytton, above the mouth of Thompson river, on February, 1912, by C. G. Cline.

The gauge is painted in black on white on a huge black rock on the left bank 200 feet above the ferry cable, a mile and a quarter above Lytton.

The datum of the gauge is referred to three bench-marks. The measuring section is 75 feet below the said cable. The initial point for soundings is a hub on the bar on the left side of the river. The said hub is under water at the higher stages, but the east face of the bottom cross timber of the cable tower on the right bank is the 860-foot mark.

Measurements are made by current meter suspended from a cable, with 30 pounds of lead. Measurements are made from the ferry, and the distance from the initial point determined by transit from the shore.

The river is in one channel. Above the station, the channel is straight for over 200 yards, and below it is straight for 400 feet. The Thompson river enters a mile below but has no effect on the section.

The bed of the river is permanent, with flat rocks and sand. The banks are not liable to overflow. It is a good section, except that the water is very swift at high stages.

The measuring section is from 300 to 675 feet wide. The depth varies from 15 feet to over 40 feet between high and low water. The mean velocity at low water is about 4·4 feet per second, and at high water, is over 10 feet per second.

Open channel conditions exist all year. The minimum flow during 1912 occurred on February 29, and was 6,800 c.f.s.

The maximum occurred on June 25, and was 173,000 c.f.s. This is greatly below the average flood.

DISCHARGE MEASUREMENTS of Fraser River, at Lytton, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Feb. 26	C. G. Cline	1046	315	2,850	4·4	10·0	12,300
Mar. 26	"	1046	310	2,803	4·1	9·4	11,500
May 31	"	1046	650	11,600	9·7	32·7	111,000
June 26	"	1046	675	16,100	10·1	34·3	162,000
July 25	"	1046	525	9,180	10·2	23·6	94,000
Sept. 29	"	1046	425	1,835	7·0	15·0	34,000

Gauging Station on Fraser River, near Lytton, B.C.

GAUGE HEIGHT AND DAILY DISCHARG

Day.	February.		March.		April.		May.		June.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				7,800	9·5	10,800	18·0	51,200	30·0	126,500
2			9·0	8,800		12,400	19·0	56,800	29·0	119,800
3				8,800		14,000		62,600	28·0	113,200
4				8,800		15,600	21·0	68,500	27·0	106,600
5			9·0	8,800		17,200		65,500	26·0	100,000
6				8,800	11·5	18,900	20·0	62,500	24·0	87,000
7				8,900		19,400	20·0	62,500	24·0	87,000
8				8,800		19,900		68,500	24·0	87,000
9				8,800		20,400	22·0	74,500	23·0	80,[illegible]00
10			9·0	8,800	12·0	21,000	22·0	74,500	23·0	80,700
11				8,800		23,200	23·0	80,700	24·0	87,000
12				8,800	13·0	25,500		80,700	25·0	93,500
13			9·0	8,800	13·5	27,900	23·0	80,700	26·0	100,000
14				9,100		28,700	23·0	80,700	27·0	106,600
15				9,400		29,500	24·0	87,000	28·0	113,200
16				9,700	14·0	30,300	25·5	96,750	29·0	119,800
17				10,000		31,500	27·0	106,600	30·0	126,500
18				10,400	14·5	32,800	29·0	119,800	31·0	133,500
19			9·5	10,800		35,400		126,600	29·0	119,800
20	10·5	14,800		10,800	15·5	37,850	31·0	133,500	30·0	126,500
21		13,800		10,800		39,100	29·0	119,800	32·0	140,500
22		12,800	9·5	10,800	16·0	40,400	28·0	113,200	35·0	162,000
23		11,800	10·0	12,800		41,300	28·0	113,200	36·0	169,500
24	9·5	10,800		10,800		42,200	28·0	113,200	36·0	169,500
25		10,100	9·0	8,800	16·5	43,000	29·0	119,800	36·5	175,000
26		9,400	9·5	10,800		45,700		126,600	34·0	155,500
27	9·0	8,800		10,800	17·5	48,400	31·0	133,500	34·0	155,500
28		7,800	9·5	10,800		49,300	33·0	148,000	33·0	148,000
29	8·5	6,800		10,800		50,200	34·0	155,500	32·0	140,500
30				10,800	18·0	51,200	34·5	159,250		137,000
31				10,800			22·5	141,250		

of Fraser River, at Lytton, for 1912.

July.		August.		September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
31·0	133,500	21·0	68,500	19·0	50,800	14·5	32,800		25,500	10·0	12,800	1
28·0	113,200	20·5	65,500	18·0	51,200	14·5	32,800		25,500	10·0	12,800	2
27·0	108,600	20·0	62,500	18·0	51,200	14·0	30,300	13·0	25,500	10·0	12,800	3
26·0	100,000	22·5	77,600	17·5	48,400	14·0	30,300	13·0	25,500	10·0	12,800	4
25·0	93,500	22·5	77,600	18·0	51,200	14·5	32,800	13·0	25,500	10·0	12,800	5
25·0	93,500	23·0	80,700	18·0	51,200	18·0	51,200	13·0	25,500	10·0	12,800	6
25·0	93,500	23·0	80,700	17·0	45,600	17·0	45,600	13·0	25,500	10·0	12,800	7
25·0	93,500	23·0	80,700	17·5	48,400	16·5	43,000	13·5	27,900	11·0	16,800	8
25·0	93,500	23·5	82,850	18·0	51,200	16·0	40,400	13·5	27,900	12·0	21,000	9
25·0	93,500	23·5	82,850	17·0	45,600	16·0	40,400	13·0	25,500	12·0	21,000	10
25·0	95,500	25·0	80,700	17·0	45,600	16·5	43,000	12·5	23,250	11·5	18,900	11
24·0	87,000	23·0	80,700	17·0	45,600	17·0	45,600	12·0	21,000	12·0	21,000	12
24·0	87,000	23·5	83,850	17·0	45,600	16·5	43,000	12·0	21,000	12·0	21,000	13
24·0	87,000	24·0	87,000	17·0	45,600	16·0	40,400	11·5	18,900	12·0	21,000	14
25·0	93,500	23·5	83,850	17·5	48,400	16·0	40,400	11·0	16,800	11·0	16,800	15
26·0	100,000	23·0	80,700	17·0	45,600	16·0	40,400	11·0	16,800	11·0	16,800	16
25·0	93,500	22·0	77,600	17·0	45,600	16·0	40,400	11·5	18,900	10·0	12,800	17
24·0	87,000	22·0	71,500	17·0	45,600	16·0	40,400	11·5	18,900	10·0	12,800	18
23·0	80,700	21·0	68,500	17·0	45,600	15·5	37,850	12·0	21,000	10·0	12,800	19
22·5	77,600	23·0	80,700	17·0	45,600	15·0	35,300	12·0	21,000	11·0	16,800	20
	76,000	23·0	80,700	16·0	40,400	15·0	35,300	12·0	21,000	10·0	12,800	21
22·0	71,500	23·0	80,700	16·0	40,400	15·0	35,300	12·5	23,250	10·0	12,800	22
23·0	80,700	23·0	80,700	17·0	45,600	15·0	35,300	12·5	23,250	11·0	16,800	23
23·0	80,700	23·0	80,700	16·0	40,400	15·0	35,300	12·0	21,000	10·0	12,800	24
23·5	83,850	24·0	87,000	15·5	37,850	15·0	35,300	12·0	21,000	10·0	12,800	25
23·5	83,850	24·0	87,000	15·0	35,300	15·0	35,300	11·5	18,900	10·0	12,800	26
23·0	80,700	24·0	87,000	15·0	35,300	14·5	32,800	11·0	16,800	10·0	12,800	27
23·0	80,700	24·0	87,000	15·0	35,300	14·0	30,300	11·0	16,800	10·0	12,800	28
22·0	74,500	23·0	80,700	15·0	35,300	14·0	30,300	10·5	14,800		12,800	29
21·5	71,500	21·0	68,500	14·5	32,[illegible]00	13·5	27,900		13,800		12,800	30
21·0	68,500	20·0	62,500			13·0	25,500	..			12,800	31

MONTHLY DISCHARGE of Fraser River, at Lytton, above mouth of Thompson, for 1912
(Drainage area, 63,000 square miles.)

Month.	Discharge in Second-Feet.				Run Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
March	12,800	7,800	9,755	0·15	0·17	600,000
April	51,200	10,800	30,763	0·49	0·55	1,830,000
May	159,250	51,200	99,563	1·6	1·8	6,120,000
June	173,000	80,700	122,197	1·9	2·1	7,270,000
July	133,500	68,500	88,923	1·4	1·6	5,460,000
August	87,000	62,500	78,777	1·2	1·4	4,840,000
September	56,800	32,800	44,608	0·71	0·79	2,654,000
October	51,200	25,500	36,934	0·59	0·68	2,270,000
November	25,500	13,800	21,598	0·34	0·38	1,285,000
December	21,000	12,800	14,955	0·24	0·28	920,000

NOTE.—The river is open all the year.
Accuracy, "B".

GILLEY CREEK (112).

Gilley (also called Munroe) creek has its source in Dennett and Gilley lakes at an elevation of 2,000 feet. The mountains around it rise to an altitude of 3,000 feet to 4,000 feet. It discharges into Pitt river, practically at sea-level. The stream is only one mile in length between Gilley lake and Pitt river, and is a series of water falls and rapids; its drainage area is about 8 square miles. It is open all year round, and the annual precipitation is about 80 inches.

Gilley Bros., Ltd., have a small industrial development (to obtain power for quarrying) on Gilley creek. A dam has been constructed on Gilley lake, which affords excellent facilities for storage. Some storage may also be obtained on Dennett lake. Gilley creek water will no doubt be used at some time for a large development, since a head of 2,000 feet may be obtained in the short distance of one mile.

The station was established on November 10, 1911, by C. G. Cline and K. H. Smith; weekly gauge readings were taken continuously to the end of December, 1912. It is located above Gilley Bros'. power intake, and measurements are made by wading. The gauge is a standard vertical staff gauge, 5 feet long, and is nailed to a stump about 50 yards above the intake. The bed of the stream is rocky, and overflow might occur, were it not that the freshet water is controlled by the dam on Gilley lake.

DISCHARGE MEASUREMENTS of Gilley Creek, above Quarry Intake, 1911-12.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Nov. 10	C. G. Cline, K. H. Smith.	1,053	3·0	3·1	1·8	1·1	5·6
1912.							
Sept. 4	C. G. Cline	1,046	6·5	6·1	1·5	1·29	9·1
Nov. 4	"	1,046	6·0	6·5	1·6	1·4	10·4

DAILY GAUGE HEIGHT AND DISCHARGE of Gilley Creek, above Quarry Intake, for 1911.

Day.	November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.		5.8		9.3
2.		5.8		9.7
3.		5.8		10.1
4.		5.8	1.4	10.5
5.		5.8		10.4
6.		5.8		10.2
7.		5.8		10.0
8.		5.8		9.8
9.		5.8		9.6
10.	1.1	5.8		9.4
11.		7.8		9.2
12.		9.8		9.0
13.		11.8		8.9
14.		13.8		8.8
15.		15.5	1.3	8.7
16.	1.7	17.1		8.4
17.		16.0		8.2
18.		15.0		8.0
19.		14.0		7.8
20.		13.0		7.6
21.		12.0		7.4
22.		10.5	1.2	7.1
23.		8.0		6.8
24.	1.2	7.1		6.4
25.		7.4		6.0
26.		7.7		5.6
27.		8.0		5.2
28.		8.3		4.8
29.		8.6		4.4
30.		8.9		4.0
31.				3.6

MONTHLY DISCHARGE of Gilley Creek, above Quarry Intake, for 1911.

(Drainage area, 8 square miles.)

Month	Discharge in Second-Feet.				Run Off		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
November	17.1	5.8	9.3	1.2	1.3	553	
December	10.5	3.6	7.9	0.99	1.1	486	
The period							80

NOTE.—Accuracy, "C."

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	3·3	....	19·4	....	7·8	....	11·6	....	23·2	1·8	19·4
2	....	3·0	1·8	19·4	....	6·6	....	11·8	....	22·4	....	17·9
3	0·8	2·7	....	20·1	....	5·9	....	12·0	....	21·6	....	16·4
4	....	3·6	....	20·0	....	5·5	....	12·2	....	20·7	....	14·9
5	....	4·5	....	20·4	....	5·0	....	12·4	....	19·8	....	13·4
6	....	5·4	....	20·8	1·0	4·6	1·5	12·6	....	18·9	....	11·9
7	....	6·3	....	21·1	....	4·8	....	12·8	....	18·0	....	10·4
8	....	7·2	....	21·4	....	5·0	....	13·0	1·7	17·1	....	8·9
9	....	8·0	1·9	21·7	....	5·2	....	13·2	....	17·1	....	7·4
10	....	8·8	....	21·0	....	5·4	....	13·4	....	17·1	1·1	5·8
11	....	9·6	....	19·3	....	5·6	....	13·6	....	17·1	....	6·0
12	1·4	10·5	....	18·7	....	5·7	....	13·8	....	17·1	....	6·2
13	....	11·0	....	18·1	1·1	5·8	....	14·0	....	17·1	....	6·5
14	....	11·5	....	17·8	....	6·0	....	14·2	....	17·1	....	6·8
15	....	12·0	....	17·5	....	6·2	....	14·4	1·7	17·1	1·2	7·1
16	....	12·5	1·7	17·1	....	6·4	....	14·6	....	17·1	....	7·1
17	....	13·0	....	16·4	....	6·6	1·6	14·8	....	17·1	....	7·1
18	....	13·6	....	15·7	....	6·8	....	14·8	....	17·1	....	7·[illegible]
19	....	14·2	....	15·0	....	7·0	....	14·8	....	17·1	....	7·[illegible]
20	1·6	14·8	....	14·3	1·2	7·1	....	14·8	....	17·1	....	7·1
21	....	15 7	....	13·6	....	7·5	....	14·8	....	17·1	....	7·1
22	....	16·6	....	12·9	....	8·0	....	14·8	1·7	17·1	....	7·1
23	....	17·5	....	12·3	....	8·5	1·6	14·8	....	17·4	....	7·1
24	....	18·4	....	11·7	....	9·0	....	16·1	....	17·7	1·2	7·1
25	1·8	19·4	....	11·1	....	9·5	....	17·4	....	18·0	....	6·6
26	....	19·4	1·4	10·5	....	10·0	....	18·7	....	18·3	....	6·0
27	....	19·4	....	10·0	1·4	10·5	....	20·0	....	18·6	....	5·4
28	....	19·4	....	9·5	....	10·8	....	21·3	....	18·8	....	4·8
29	....	19·4	....	9·5	....	11·0	....	22·7	....	19·0	....	4·2
30	....	19·4	....	....	....	11·2	2·0	24·0	....	19·2	....	3·6
31	....	19·4	....	....	....	11·4	....	....	....	19·3	....	....

Gilley Creek, above Quarry Intake, for 1912.

July.		August.		September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
	3·0		0·5		7·8	1·4	10·5		10·2		8·7	1
	2·4		0·5		8·1		10·0		10·3		8·7	2
	1·8		0·5		8·3		9·5		10·4		8·7	3
0·6	1·2		0·5	1·29	8·5		9·0	1·4	10·5		8·7	4
	1·2		0·5		8·6		8·5		11·0		8·7	5
	1·2	0·5	0·5	1·3	8·7		8·0		11·5		8·7	6
	1·2		0·6		8·6		7·5		12·0	1·3	8·7	7
	1·2		0·7		8·4	1·2	7·1		12·5		9·0	8
	1·2		0·8		8·2		7·1		13·0		9·3	9
	1·2		0·9		8·0		7·1		13·5		9·6	10
	1·2		1·0		7·8		7·1		14·0		9·9	11
	1·2		1·0		7·6		7·1		14·5		10·2	12
0·6	1·2		1·1		7·5		7·1		15·0	1·4	10·5	13
	1·2	0·6	1·2		7·4	1·2	7·1		15·5		10·2	14
	1·2		1·3		7·3		7·2		16·0		10·0	15
	1·2		1·4	1·2	7·1		7·4		16·5		9·8	16
	1·2		1·5		7·0		7·6		17·0		9·6	17
	1·2		1·6		6·8		7·8		17·5		9·4	18
	1·2		1·7		6·6		8·0		18·0		9·2	19
0·6	1·2		1·8		6·4		8·2		18·5		9·0	20
	1·0	0·7	1·9		6·2		8·4		19·0		8·7	21
	0·9		2·8		6·1		8·6		19·2		8·4	22
	0·8		3·7		6·0		8·8	1·8	19·4		8·1	23
	8·7		4·6		5·9		9·0		18·0		7·8	24
	0·6		5·0	1·1	5·8		9·2		16·5		7·5	25
0·5	0·5		5·4		6·4		9·4		15·0	1·2	7·1	26
	0·5		5·8		7·0		9·6		13·4		7·1	27
	0·5		6·2		7·7		9·8		11·8		7·1	28
	0·5		6·6		8·4		9·9		10·2		7·1	29
	0·5	1·2	7·1		9·4		10·0	1·3	8·7		7·1	30
	0·5		7·5				10·1				7·1	31

MONTHLY DISCHARGE of Gilley Creek, above Quarry Intake, for 1912.

(Drainage area, 8 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
January	19·4	2·7	12	1·5	1·7	738	
February	21·7	9·5	16	2·0	2·2	920	
March	11·4	4·6	7·3	0·91	1·0	449	
April	24·0	11·6	15·1	1·9	2·1	898	
May	23·2	17·1	18·3	2·3	2·65	1,130	
June	19·4	3·6	8·4	1·0	1·1	500	
July	3·0	0·5	1·4	0·18	0·21	86	
August	7·5	0·5	2·5	0·31	0·36	154	
September	9·4	5·8	7·4	0·9	1·0	440	
October	10·5	7·1	8·4	1·0	1·1	516	
November	14·3	1·8	14·3	1·8	2·0	851	
December	10·5	7·1	8·7	1·1	1·3	535	
The year	24·0	0·5	9·9	1·2	16·7	7,220	80

NOTE.—These results are obtained from three measurements only.
Accuracy, "C."

GOLD CREEK (122).

Gold creek is a small tributary of Coquitlam river from the east, about 2 miles below the outlet of Coqui[illegible]n lake.

The flow of this sta[illegible] is of importance on account of the riparian and other rights on lower Coquitla[illegible]ver, which are liable to be affected by the damming of Coquitlam river at the lake, and the diversion of the water to lake Buntzen.

A regular hydrographic station was established on Gold creek on October 25, 1912, by C. G. Cline. The gauge is located about one-quarter mile from the mouth. It is a vertical staff gauge fastened to the stump of a 4-inch alder tree on the right bank of the stream. The datum of the gauge is referred to three bench-marks.

The measuring section is about 100 feet above the gauge.

Gold creek is a rapid mountain stream, about 30 to 40 feet wide and, at high water, about 3 feet deep. On October 26, 1912, the discharge was 124 c.f.s., with a mean velocity of 2·6 feet per second.

The following float measurements during 1910, 1911 and 1912, were taken by Mr. R. S. Stronach, departmental resident engineer at Coquitlam dam:—

GOLD CREEK.

Date.	Discharge	Date.	Discharge	Date.	Discharge
1910.	c. f. s.	1911.	c. f. s.	1911.	c. f. s.
July 26	30	January 24	13	October 16	76
July 29	28	January 27	12	October 21	27
August 2	20	January 31	17	October 26	26
August 5	18	February 10	17	November 1	21
August 9	17	February 14	12	November 7	53
August 12	16	February 17	14	December 19	91
August 16	14	February 19	12	December 22	183
August 19	14	February 22	10	December 28	42
August 23	16	February 26	8	1912	
August 26	15	March 5	15	January 2	32
August 30	16	March 10	35	January 10	19
September 1	16	March 13	83	January 16	41
September 6	16	March 19	22	January 26	37
September 9	14	March 25	42	January 29	130
September 13	12	March 28	27	February 4	42
September 16	10	March 31	23	February 16	49
September 20	8	April 4	20	February 23	19
September 23	7	April 11	30	March 1	17
September 30	37	April 19	23	March 10	16
October 3	73	April 25	34	March 16	13
October 4	72	April 28	28	March 22	15
October 6	102	May 4	107	March 28	21
October 8	98	May 9	102	April 7	18
October 10	47	May 16	87	April 20	19
October 18	54	May 21	31	May 4	75
October 25	49	May 27	29	May 13	33
October 29	38	June 1	23	May 18	24
November 1	45	June 6	20	June 3	19
November 4	42	June 12	17	July 10	23
November 7	147	June 16	22	July 16	17
November 10	149	June 20	17	July 22	15
November 12	110	June 27	23	July 24	16
November 16	47	July 7	22	July 30	14
November 21	210	July 26	15	August 12	23
November 22	175	August 1	14	August 17	24
November 26	47	August 5	12	August 25	17
November 29	27	August 11	13	September 11	27
December 2	32	August 14	12	September 13	21
December 6	157	August 25	10	September 27	15
December 8	127	August 29	6	October 4	18
December 10	47	August 31	5	October 9	21
December 12	29	September 4	4	October 11	17
December 16	31	September 10	5	October 20	97
December 23	93	September 13	42		
December 27	43	September 17	23		
December 30	60	October 6	15		
1911		October 10	18		
January 8	37				
January 11	26				
January 20	17				

Gordon Creek (266).

Gordon creek is called Dairy creek on the Dominion Government maps. It is a small irrigation stream, about 4 miles long, flowing into North Thompson river from the west, some 13 miles from Kamloops. The creek is about 3 feet wide, and only a few inches deep. All the water is used for irrigation.

On June 21, 1911, the discharge was only 0·4 c.f.s., and during July and August the creek was dry.

In 1912, the maximum discharg[illegible]rred on May 17, and was about 7 c.f.s., lasting only for the one day. On May 2[illegible] had decreased to 2·5 c.f.s. During June the mean flow was 1 c.f.s., and in July only 0·5 c.f.s.

See miscellaneous measurements of Gordon creek in list of miscellaneous discharge measurements.

Greenstone Creek (261).

Greenstone creek has its source in Big Fish lake township 18, range 20, west 6th meridian, at an elevation of 4,820 feet, and discharges into Meadow creek, 8 miles from the mouth, at an elevation of 4,000 feet. It is part of the Guichon-Nicola Thompson drainage; the drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 20 square miles. This is a contentious irrigation stream in the Dry Belt; the summers are hot and dry, the winters long and very cold (−30 F.); the mean annual precipitation is about 15 inches.

Greenstone creek is about 6 miles long, and drains Face and Big Fish lakes. There is no agricultural land except the Watson meadows at the mouth; there is a record of 1,000 inches appurtenant to this land. In addition, the British Columbia Fruitlands Co. and the Beaton Estate have records of 500 inches each to divert water from Face lake and Big Fish lake, respectively, into the Thompson drainage; while the mean run-off of the creek during the irrigation season of 1912 (an exceptionally wet season) was less than 10 second feet or 350 inches. The British Columbia Fruitlands Co. propose to turn the water from Face lake into the head-waters of Cherry creek, and thence via Cherry creek to their estates. The Beaton estate proposes to build an earthen ditch 22 miles long in a northwesterly direction to its ranch in the Cherry Creek valley; the ditch would receive water from Duffy, Chartrand and Three-mile creeks, en route, provided the application for water for these estates were granted. The combined area of Big Fish and Face lakes is approximately 500 acres, and the lakes could be dammed to a height of 15 feet; but as the drainage area of the two lakes is only 20 square miles, it seems improbable that there will be enough water to make the schemes practicable from a commercial standpoint. Both of these schemes are meeting with strenuous opposition from the interests on Guichon creek, especially Lower Nicola.

The river station was established September 14, 1911, by W. M. Carlyle. The measuring section is located about one-half mile from the mouth. A standard vertical staff gauge is located on the left bank at the measuring section. All the measurements are made by wading, though in high water, measurements have to be made at the Chartrand-Trout lake road, where the water runs in two channels. The measuring section is only fair, as part of the creek apparently sinks, reappearing below the measuring section. The control, however, is good, the current uniform, the channel permanent, and the banks not liable to overflow, unless the channel were blocked by logs which are abundant.

DISCHARGE MEASUREMENTS of Greenstone Creek, one-half mile above mouth, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
April 30	H. J. E. Keys..	1057	13·	5·5	0·85	0·70	4·70
May 15 ...	"	1057	37·	3·0	2·70	2·10	81·7
May 23.. ..	"	1057	29·	17·	2·0	1·15	34·6
June 3	"	1057	9·	5·15	2·5	0·78	12·9*
June 8	"	1057	8·5	3·90	2·0	0·68	7·8
July 15 ...	"	1057	6·5	3·20	0·9	0·55	2·9
Sept. 13 ...	"	1057	4·0	0·80	1·0	0·45	0·8

*New measuring section.

GAUGE HEIGHTS AND DAILY DISCHARGE of Greenstone Creek, one-half mile above mouth, for 1912.

Day.	May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		8·0		9·7		3·6	0·5	1·7		
2	0·8	12·0		7·1		3·7				
3		16·0	0·6	4·5		3·7				
4		20·0		5·0		3·8				
5	1·0	23·0		5·5		3·9				
6		47·0		6·0		5·9				
7		59·0		6·5		4·0				
8		77·0	0·68	7·3		4·1				
9	2·2	95·0		6·5		4·1				
10.		82·0		6·0		4·2				
11.	1·8	69·0		5·5		4·3				
12		74·0		5·0		4·3				
13		79·0	0·6	4·5		4·4			0·45	0·85
14		84·0		5·1	0·6	4·5				
15	2·1	88·0		5·7	0·55	3·1				
16		76·0	0·65	6·2		2·4				
17		64·0		5·8	0·5	1·7				
18		52·0		5·4		1·2				
19	1·3	39·0		5·0	0·45	0·8				
20		36·0		4·6		1·2				
21		33·0		4·2	0·5	1·7				
22	1·15	30·5		3·8		1·7				
23		29·7		3·4		1·7				
24		28·9	0·55	3·1	0·5	1·7				
25	1·1	28·0		3·2		1·7				
26		25·4		3·3	0·5	1·7				
27		22·8		3·3		1·7				
28		20·2		3·4		1·7				
29	0·9	17·5		3·5	0·5	1·7				
30.		14·9		3·5		1·7				
31		12·3			0·5	1·7				

MONTHLY DISCHARGE of Greenstone Creek, one-half mile above the mouth, for 1912
(Drainage area, 20 square miles.)

Month	DISCHARGE IN SECOND FEET.				RUN OFF		RAINFALL
	Maximum.	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	95	8	41	2.2	2.54	2,700	
June	9.7	3.4	5	0.25	0.28	297	
July	4.5	0.8	2.8	0.14	0.16	172	
The period							15

NOTE.—In 1914 the maximum flow of Greenstone creek was only about 15 c.f.s., about the middle of May. By the middle of June it had decreased to 3 c.f.s. and in July and August, it was zero. Accuracy "A" and "C."

GUICHON CREEK (213 AND 214).

Guichon creek is also called Ten-mile creek, Mamette creek, Na-n-a creek, Kazo . . Kamaix Broom creek, Big creek. It empties into Nicola river from the north, ab . 35 miles east of Spence's Bridge. It has three main tributaries. These are, reckoni . from the north:

1. Main Guichon creek, flowing almost due south from about the center of tow . ship 19, range 22, west of 6th meridian (elevation 1,000 feet) for a distance of 12 mil . In section 1, township 18-21-6, it is joined by Witch creek.

2. Witch Creek enters main Guichon creek from the west; it is about 10 mi . long, its main source being Divide lake in section 1, township 18-23-6 (elevation 3,9 . feet). There is very little farm land up Witch creek except hay meadows, no pe . manent settlers, and particularly no irrigation. (See discharges of Witch creek . 1912.)

3. Meadow creek is the largest of the three tributaries. It forms into the ma . creek from the east in section 27, township 17-21-6, about three miles south of Wit . creek. Meadow creek is some 15 miles long, and flows partly through a series . meadows lined with willow. It has several tributaries of its own, the principal . being Greenstone creek, which is the outlet of Big Fish and Face lakes (elevat . 4,800 feet). There are also small streams entering Meadow creek from Trout l. . and Ridge lake. (See discharges of Meadow creek for 1911 and 1912.)

Nearly half a mile south of the mouth of Meadow creek is the south limit of . Railway Belt, and three miles farther south Guichon creek flows into Mamit la. . This lake is about 2 miles long and in some places nearly one-half mile wide (ele . tion 3,270 feet). Leaving Mamit lake, Guichon creek flows due south for 15 miles . empties into Nicola river.

Numerous small streams enter Guichon creek throughout its length, such . Chartrand, Quenville, Ray, and Eight-mile creeks. These are used for irrigation, . they dry up in the summer just when the water is badly needed.

Guichon valley is, in general, very narrow with sloping benches rising on each s . from 200 feet to 1,000 feet above the creek. These benches, particularly on the . side, are suited only for grazing, being too dry for farming, and there is insuffici . available water for irrigation. On account of their height above Guichon creek . waters of that stream cannot be applied. The timber is rather scattered, even near .

head-waters, where the land is used for summer ranges. On the west side, especially from Mamit lake down, the timber is more dense, but is not of a merchantable size.

The valley proper is very narrow, with little farming land. In about seven or eight places in the thirty miles of its length it widens to nearly half a mile in width. These wider bottom lands, with adjoining gently sloping lands, constitute the ranches of the Guichon valley. Owing to the high altitude (about 3,000 feet) they are ranching rather than farming lands, hay being the principal crop, although some vegetables are also grown, and a little mixed farming attempted. Early frosts are prevalent. Even if an abundance of [illegible] were [illegible] the scattered farms, the distance from markets precludes the possibility of the district ever becoming important except as a ranching district.

A good wagon road from [illegible] to Nicola [illegible] runs along the east side of Guichon creek.

At the mouth of Guichon creek, however, the situation changes somewhat. The valley widens, and where it joins the Nicola river there is a tract of some 1,600 acres of very good irrigable farm land, in addition to the large Nicola Indian Reserve. This is called the Lower Nicola district. The land may be irrigated from Guichon creek, although with a little expense almost 50 per cent could be irrigated from Nicola river. By irrigation, hay and vegetables are grown, with a little fruit and grain. The development has not been very extensive, only [illegible] acres being as yet under cultivation. Although some of the ten or twelve farms are well run, the district does not give evidence of great enterprise, particularly in the irrigation methods followed.

The Nicola valley branch line of the C.P.R. runs through these Lower Nicola lands.

The drainage area of Guichon creek is about 475 square miles, being divided as follows:—

	Square Miles.
Main Guichon creek above Witch creek. Elevation ranging from 3,500 feet to 5,000 feet	73
Witch creek. Elevation ranging from 3,500 feet to 5,000 feet	41
Meadow creek. Elevation ranging from 3,000 feet to 5,500 feet	145
Chartrand creek. Elevation ranging from 3,000 feet to 4,500 feet	25
Quenville creek. Elevation ranging from 3,000 feet to 4,000 feet	7
Rey creek. Elevation ranging from 3,250 feet to 5,000 feet	24
Eight-mile creek. Elevation ranging from 2,500 feet to 5,500 feet	30
Other small tributaries and adjacent basin, Guichon Creek proper. Elevation ranging from 1,800 to 5,000 feet	130
Total drainage area	475

The rainfall varies according to the elevation, ranging from 12 inches at the mouth of the Guichon to 18 inches in the higher altitudes of the catchment basin. Snowfall also varies from 12 inches in the Nicola valley to 4 feet in the hills. There have been as yet no studies or investigations of the precipitation, evaporation, seepage, run-off, etc., in British Columbia, and only rough estimations can be made of these important data.

A number of gauging stations for determining the discharge of Guichon creek and its tributaries were established during 1911 and 1912 by the Hydrographic Survey, and measurements were made at different stages. See discharges, etc., at the following stations: Guichon creek (above Mamit lake), Guichon creek (at mouth), Witch creek, Meadow creek, Greenstone creek, Leighton's ditch, and Quenville creek.

During the latter part of March the winter's snow begins to melt, gradually increasing until the maximum flood stage is reached about the middle of May. After this date the flow decreases until September 1, the discharge during July and August being insufficient for irrigation needs. The maximum discharge at the May flood is from twenty-five to forty times the minimum discharge in August. The fall rains produce a slight increase in the flow, only to recede again as winter sets in, the winter minimum being reached in February.

The natural reservoir for storing the waters of Guichon creek is Mamit lake. This lake is about two miles long, and in some places nearly one-half a mile wide. It has a superficial area of over 400 acres. The water level between high and low water varies about 4 feet. By damming the outlet of Mamit lake, and raising the level to a height of one foot above ordinary high-water mark, and in addition lowering the outlet 1 foot, 6 feet of water could be easily stored in this reservoir. There is more than enough water flowing in Guichon creek from April 1 to August 1 to fill this reservoir, even neglecting the fall and winter flow. This stored water need not be called upon until July, the normal flow being sufficient for the first irrigation. A great deal of water of Guichon creek is lost by seepage between Mamit lake and Lower Nicola, a distance of 15 miles, even though the carrying ditch is the well-defined bed of the creek.

The necessary storage works on Mamit lake would be a timber-cribbed, earth-filled dam, 60 feet long and 10 feet high, at the southerly end of the lake. This construction would be comparatively easy and cheap, all the materials being at hand. Lowering the outlet 1 foot would necessitate clearing the bed for a distance of 400 feet. If the irrigators co-operated in this work during the slack fall season, when the water is low, the cost of construction would be very small. At a somewhat greater expense, the storage capacity of Mamit lake could be considerably increased beyond the above estimate.

The impounding of waters in Mamit lake in this way would mean the flooding of some 55 acres of bottom lands, owned by Quenville (at the north end) and Laycock (at the southeast end). These lands produce a wild hay or grass, and during ordinary years are flooded for the greater part of the season, only one crop being obtained each year.

In Guichon creek, as in most streams of the Dry Belt, storage is the solution to the irrigation troubles due to the scarcity of water during the summer months.

WATER RECORDS ON GUICHON CREEK.

The provincial water records on Guichon creek (both within and outside the Railway Belt) may be divided into three divisions: (1) Lower Nicola, (2) lands along upper Guichon creek and its tributaries, (3) diversion records into other watersheds.

(1) Lower Nicola Records and Appurtenant Lands.

Present Owner	Original Licensee	Date of Record	Amount of Water.	Description of Land.		Irrigable.	Irrigated at present.
			Miner's inches.			Acres.	Acres.
Wm. Smith	I. Sachell	1873	300	L.	131	200	35
A. G. Collett	T. Schwartz	1878	300	L.	129	300	200
	T. Schwartz	1885	300	L.	129		
D. Dodding	D. Dodding	1904	100	L.	132	120	80
R. Whitaker	F. D. Woodward	1904	100			175	40
Jas. Smith	Jas. Smith	1904	100	L.	164	200	20
L. Austin	H. M. Woodward	1906	200	L.	134	100	35
				L.	135		
B. Bonthrone	B. Bonthrone	1906	100	L.	133	250	75
H. Stumbles	H. Stumbles	1906	100	L.	1612	135	
H. Lindley	H. Lindley.	1906	100	L.	160	110	60
Mrs. Fleck							
Geo. Smith	S. J. Woodward	1909	100	L.	163S	40	10
A. Sims	A. Sims	1906	100	(No longer in district)			
			1900			1,630	555

The amount of water recorded is far in excess of the future needs of the district. For the total irrigable area of 1,630 acres, 800 miner's inches (or 25 second-feet flowing for 100 days of the irrigating season) is sufficient. Besides, fully 700 acres of the Lower Nicola district can be irrigated from Nicola river. At present, only some 550 acres are under cultivation, and although the ranchers all declare that they will have many more acres cleared and in crop in a very few years, the prospects of such development do not look assuring.

The Naik (or Nicola-Mamette) Indian Reserve, situated at the mouth of Guichon creek, comprises 11,000 acres. Of this, about 1,500 acres are irrigable from Guichon creek and Nicola river. A record of 300 miner's inches from Guichon creek was allotted to this reserve in 1878. The present and future irrigation needs of this reserve should certainly be protected. If this reserve should ever pass into the hands of whites, or the Indians be assisted in up-to-date irrigation methods, the water requirements would be in excess of the present rights, but it is questionable if the present development of other lands should be retarded for the sake of that remote possibility.

(2) Records of Lands on Upper Guichon Creek and its Tributaries.

(1) There are several records on Eight-mile creek, but only a small quantity of water yet used. At present it does not affect Lower Nicola. The possibilities of the scattered irrigable parcels of land up Eight-mile creek are very limited. (Wholly outside the Railway Belt).

(2) J. Murray has a record for a small stream just north of Eight-mile creek. Little or no importance to Guichon creek. He cannot irrigate from Guichon creek water.

(3) John Marquart has a record for 200 inches (dated 1891) from the same small stream as Murray. Same remarks apply as to Murray. (Wholly outside the Railway Belt).

(4) C. A. Sapondowski's land is on Guichon creek, 5 miles north of Eight-mile creek. He holds no records, but uses a small creek called McIlvoy creek for domestic

purposes. He could irrigate 60 acres from Guichon creek. (Wholly outside the Railway Belt.)

(e) J. C. Bampfield is the present owner of the old Rey place, at the south end of Mamit lake. For this land he holds a record for 500 inches from Rey creek (dated 1894). By storing the waters of Rey creek in a lake up that stream, sufficient could be obtained for the whole ranch. J. P. Phelps has a place up Rey creek, holds a recent record for 1 second foot (1910). His supply is dependent upon needs of Bampfield. It is also reported that water is being diverted from the head waters of Rey creek into Clapperton creek watershed. (Wholly outside of the Railway Belt.)

(f) J. Laycock, on the east shore of Mamit lake, has a record for 1 second foot (1910) from a small tributary of Guichon creek. Very little importance. Bampfield holds a record for the Rey ranch from a small stream that may be the same as Laycock's stream. Mr. Laycock desires a record from Meadow creek. Laycock's land is outside the Railway Belt.

(g) L. Quenville owns 700 acres of irrigable land extending from Mamit lake to the south limit of the Railway Belt. He holds a record from Quenville creek for inches (dated 1890). There is not enough water in Quenville creek for his needs during July and August, although some effort could be made to store the spring flow. Mr. Quenville wants a record from Meadow creek.

(h) A record of 50 inches was allotted from Meadow creek in 1878 to Pipseul I.R., at the mouth of that stream (also called Pipseul creek). Only a few acres of reserve are being irrigated (for hay). Inside the Railway Belt.

(i) A. Chartrand owns a good ranch with 200 acres of irigable land on Guichon creek at the mouth of Witch creek. He holds no record, but uses a little water for irrigation from both Witch creek and Chartrand creek. (Within the Railway Belt.) He desires a record from these streams.

(j) J. Latremouille owns lot 781 (Proteau place) on Guichon creek in township 18-21-6. He holds no records, uses a little water from Guichon creek. Rather a dry ranch. Within the Railway Belt.

(k) Fransi Allen owns a homestead in section 30, township 18-21-6. He holds a record for 200 inches from Guichon (dated 1891). He is affected by the Leighton diversion from Guichon creek, and his rights should be protected. Within the Railway Belt.

(l) D. Cousineau has a homestead in northwest corner of township 17-20 on Meadow creek. He holds no records. Uses water from a small stream flowing through his farm. He has applied for a record of 100 inches from Greenstone creek.

(m) Neil Beaton owns the Watson Meadows or Meadow creek, at the mouth of Greenstone creek. He holds a record for 1,000 inches from Greenstone creek (Young creek) recorded by Randall Young in 1889. Only a few acres have been irrigated under this record, and now Mr. Beaton wishes to transfer the record to land owned by him in Thompson valley. This record should be reduced to a minimum quantity, certainly the transfer should not be allowed. Within the Railway Belt. See also Beaton's diversion record from the same source of supply (Big Fish lake).

(5) *Diversion Records from Guichon Drainage Area.*

(1) Barnes record (now held by Ellen Benjamin), dated July 17, 18[illegible] for inches to be diverted from Guichon creek and taken in a northwesterly direction by Barnes creek to lot 1, group 4, near Ashcroft. It has never been used, and should be cancelled for non-use and impracticability.

(2) Pennie's record (now held by British Columbia Horticultural estates,

[illegible] dated 1884, for 300 inches [illegible] creek to Pennie's [illegible] near W[illegible]. It has never been [illegible], and should be cancelled.

[illegible] Beaton record [illegible] and held by Mr. Beaton, dated October 28, 1904, [illegible] inches from Big Fish lake [illegible] to be diverted for a distance [illegible] miles to certain lands in Thompson [illegible]. Not yet [illegible].

[illegible] Roper record [illegible] Ranchlands Co., dated May 15, [illegible] the 300 inches from F[illegible] lake [illegible] to be diverted via Big Fish [illegible] in a manner similar to the Beaton [illegible].

Although Big Fish and F[illegible] lakes are [illegible], I greatly doubt that sufficient water can be obtained from them to [illegible] Beaton and Roper records for [illegible] inches. The drainage area of these lakes [illegible] square miles. The construction of the [illegible] would be a very expensive undertaking. [illegible] these records should not be [illegible] and reduction [illegible] the [illegible] of [illegible] creek for 1912.

[illegible] J. B. Leighton record, dated [illegible] from [illegible] creek and T[illegible] lake, thence [illegible] natural channel [illegible] branch [illegible] creek [illegible].

[illegible] R. F. Leighton record, dated [illegible] creek during the spring freshet and in the fall when not required for [illegible] Big [illegible] lake, thence [illegible] Three-m[illegible] creek [illegible] J. B. Leighton.

[illegible] A. H. [illegible] record, dated [illegible] the same [illegible] R. F. Leighton record [illegible] Mr. [illegible] and [illegible] should be cancelled.

[illegible] Mr. J. B. Leighton [illegible] and R. F. [illegible] water records [illegible]

[illegible] T[illegible] and L[illegible]

[illegible] of Leighton [illegible] creek.

The farmers of Lower N[illegible] creek [illegible] with the [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(2) The water of the Guichon drainage area at Lower Nicola and Guichon valley proper is not being beneficially used at the present time; a great amount of water is allowed to run to waste in the spring; the irrigation works, head-gates, ditches and flumes are not of the most approved construction for the beneficial use of water; and the water users have made no attempts to alleviate their own troubles by storing or conserving their water supply.

(3) Storage of the surplus waters of the spring floods can be conveniently and economically performed. The farmers of Lower Nicola, while admitting that the waters can be stored in Mamit lake, and that in this way a sufficient supply can be obtained for their needs, contend that it is unfair to ask them to undergo the trouble and expense of such storage constructions merely to give Mr. Leighton water, and they claim that Mr. Leighton, the Government, or some one should assist in the expense of the storage works.

(4) Fully 700 of the 1,600 irrigable acres in Lower Nicola have an alternative water supply in Nicola river, which can be called upon at an expense not at all prohibitive or unreasonable. The supply in Nicola river is unlimited, and some of the farmers are contemplating using this stream, and thereby making themselves independent of an unreliable supply.

(5) The claim of the farmers of Lower Nicola that their scarcity of water during the past two years (1910-11) has been due to the Leighton diversion cannot be wholly proven. While it may be true in a small degree, I believe that the scarcity has in a greater proportion been due to the extreme dryness of the seasons of 1910 and 1911, during which years the water supply in many districts of the Dry Belt was very low. The Leighton diversion taps only 24 sq miles of the 475 square miles of the Guichon drainage area, and while the run-off per square mile in the vicinity of these upper 24 miles is greater than the average for the whole drainage area, yet the influence of the diversion is not as great as is claimed. On June 19, 1911, there was a discharge of only 4 second-feet in Guichon creek at the Leighton diversion, and at the same date 9 second-feet were running to waste at the mouth of Guichon creek.

Guichon Creek, Near Mouth (213).

This station was established on June 4, 1911, in order to determine the amount of waste water in Guichon creek not used by the farmers of Lower Nicola, who were protesting to the Dominion and Provincial Governments that they were suffering from water shortage due to the Leighton diversion of Upper Guichon creek water into Thompson River drainage. The station is located below all diversions, the gauge and measuring section being about 25 feet above the C.P.R. bridge across Guichon creek (Nicola Valley branch) and about 150 yards above the mouth of the creek as it flows into Nicola river.

The gauge is a standard staff gauge, 5 feet long. It is fastened to a large tree stump on the right bank, 25 feet above the bridge.

Three bench-marks were established to which the zero of the gauge was referred.

DISCHARGE MEASUREMENTS of Guichon Creek, near mouth, 1911-12.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1911							
June 4	W. M. Carlyle	1044	28	35·8	1·6	2·22	58·7
June 17	C. E. Richardson	1048	18	13·4	·7	1·37	9·1
June 19	"	1018	16	10·	·5	1·20	4·7
July 11	"	1048	2	65	·6	·85	·41*
1912.							
May 3	"	1018	32	54·2	3·0	2·87	163·
May 23	C. G. Cline	1046	42	69·6	5·0	3·60	345
July 4	B. Corbould	1044	13	9·6	0·9	1·71	8·9
July 22	"	1044	13·5	13·4	1·5	1·85	20·0
Aug. 12	"	1044	13·	10·	0·9	1·7	9·2

*Different section.

DAILY GAUGE HEIGHT AND DISCHARGE of Guichon Creek, near mouth, for 1911.

DAY.	JUNE. Gauge height.	JUNE. Discharge.	JULY. Gauge height.	JULY. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	.....	61·5	0·9	1·0
2	....	61·5	0·85	0·6
3	2·25	61·5	0·85	0·6
4	2·2	61·5	0·85	0·6
5	2·2	56·5	0·85	0·6
6	2·15	56·5	0·85	0·6
7	2·05	52·0	0·75	0·2
8	1·95	43·3	0·75	0·2
9	1·88	35·3	0·75	0·2
10	1·85	30·5	0·75	0·2
11	1·8	28·6	0·85	0·6
12	1·7	25·6	0·75	0·2
13	1·62	20·5	0·9	1·0
14	1·5	17·2	0·95	1·5
15	1·4	12·7	0·9	1·0
16	1·35	9·6	0·85	0·6
17	1·3	8·3	0·85	0·6
18	1·15	7·0	0·85	0·6
19	1·10	4·1	0·85	0·6
20	1·05	3·3	0·85	0·6
21	1·02	2·6	0·85	0·6
22	1·0	2·2	0·85	0·6
23	1·0	2·0	0·8	0·3
24	1·0	2·0	0·8	0·3
25	1·0	2·0	0·75	0·2
26	1·0	2·0	0·75	0·2
27	0·9	2·0	0·75	0·2
28	0·9	1·0	0·7	0·0
29	0·95	1·0	0·7	0·0
30		1·5	.....	....
31	..		......	..

MONTHLY DISCHARGE of Guichon Creek, near mouth, for 1911.

(Drainage area, 475 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	61·5	1·0	22·[illegible]	0·05	0·06	1,340	
July	1·5	0·0	0·5	0·001	0·001	31	
The period							11

NOTE.—The station was established on June 4, after the maximum flood had passed. The stream at the station ran dry on July 28. The year 1911 was an exceedingly dry year in the Dry Belt.

Accuracy. "C."

GAUGE HEIGHT AND DAILY DISCHARGE of Guichon Creek, near mouth, for 1912.

May.		June.		July.		August.		September.		Day.
Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
.....	168	2·5	96	1·7	9	1·8	16	....	....	1
.....	168	2·4	81	1·7	9	.....	20	1·8	16	2
2·9	168	2·3	67	1·7	9	1·9	24	.....	18	3
3·1	210	2·2	55	1·7	9	....	22	1·85	20	4
3·3	260	2·1	43	1·8	16	1·85	20	.....	22	5
3·5	315	2·0	32	1·8	16	....	18	1·9	24	6
3·8	420	2·0	32	1·8	16	1·8	16	.....	24	7
4·0	490	1·9	24	1·8	16	....	12	1·9	24	8
4·1	530	1·9	24	1·9	24	1·7	9	.....	22	9
4·3	610	1·9	24	1·9	24	....	10	1·85	20	10
4·4	650	1·9	24	2·0	32	1·72	10	....	....	11
4·5	695	1·9	24	2·1	43	....	11	....	....	12
4·3	610	1·9	24	....	43	1·75	12	....	....	13
4·2	570	1·9	24	2·1	43	....	13	....	....	14
4·3	610	1·9	24	....	38	1·78	15	....	....	15
4·4	650	1·9	24	2·0	32	....	15	....	....	16
4·5	695	1·9	24	....	32	1·8	16	....	....	17
4·3	610	1·9	24	2·0	32	....	16	....	....	18
4·2	570	1·9	24	....	32	1·8	16	....	....	19
4·0	490	1·9	24	2·0	32	....	18	....	....	20
3·9	455	1·9	24	....	26	1·85	20	....	....	21
3·8	420	1·8	16	1·85	20	....	22	....	....	22
3·6	345	1·8	16	....	22	1·9	24	....	....	23
3·5	315	1·8	16	1·9	24	....	22	....	....	24
3·4	285	1·8	16	....	24	1·85	20	....	....	25
3·2	235	1·7	9	1·9	24	....	19	....	....	26
3·0	188	1·7	9	....	24	1·82	18	....	....	27
2·9	168	1·7	9	1·9	24	....	17	....	....	28
2·8	149	1·7	9	....	22	1·8	16	....	....	29
2·7	131	1·7	9	1·85	20	....	16	....	....	30
2·6	113	....	....	....	18	1·8	16	....	....	31

MONTHLY DISCHARGE of Guichon Creek, near mouth, for 1912.

(Drainage area, 475 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	95	113	397	0·84	1·0	21,400	
June	96	9	28·4	0·06	0·07	1,690	
July	43	9	24·4	0·05	0·06	1,500	
August	24	9	16·7	0·035	0·04	1,030	
The period							12

NOTE.—Readings were commenced about May 1 and continued until September 10. The year 1912 was a wet year in the Dry Belt, and the supply of water for irrigation was good in almost every district. It will be noted that there was water running to waste in Guichon creek all summer, even though the quantity diverted by Leighton was much greater than in 1911.

Accuracy, "B."

GUICHON CREEK, ABOVE MAMIT LAKE.

The station on Guichon creek above Mamit lake was established on June 3, 1911, by W. M. Carlyle. The measuring section is at a private bridge on Quenville's ranch, about a mile or so above Mamit lake. At high water in May, 1912, this section was flooded over the bridge, and high water measurements were taken at a bridge higher up stream (1 mile), and the discharge of Quenville creek measured and added.

The gauge is a vertical staff (cedar) graduated in feet and tenths with black paint. The gauge is fastened to right-hand upper side of bridge. Replaced by new enamelled iron gauge, 6 feet long, in 1912.

Measurements are made by a small Price electric current meter, suspended by cable; measurements being made from the bridge at high water. At low water, wading measurements with wading rod were made.

The initial point for soundings is at edge of the right bank at upper side of bridge.

The water is fairly swift. Velocity at high water, 1·5 to 2·0 feet per second. The channel above the station is straight for 25 feet. The channel below the station is straight for 50 feet. The right bank is clean, sandy, liable to overflow during excessive floods; about 4 feet high. The left bank is clean, about 4 feet high; liable to overflow during excessive floods.

Bed of the stream is sand and gravel; may shift a little, but not to seriously affect the gauge; one channel always; average depth, about 2 feet; at low water, 1 foot; at high water, 6 feet. There is a slight chance of backwater on lower side of the bridge, on account of brush and fence.

The following bench-marks were established:—

B.M. No. 1.—Elevation, 6·92 feet; nail driven horizontally in west side of fence post on left upper side of the bridge.

B.M. No. 2.—Elevation, 6·08 feet; nail driven vertically in abutment on lower side of bridge.

B.M. No. 3.—Elevation, 7·79 feet; nail driven horizontally in fourth fence post from left upper side of bridge.

(Elevations are referred to zero of gauge.)

DISCHARGE MEASUREMENTS of Guichon Creek, above Mamit Lake, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
June 3	W. M. Carlyle	1044	27	41·7	1·50	2·16	61·3
June 27	"	1044	16	10·1	0·73	0·96	7·4
July 18	"	1044	16	9·2	0·51	0·87	4·7
Aug. 2	"	1044	10	4·1	0·64	0·80	2·6
Aug. 9	"	1044	15	7·4	1·30	1·02	9·8
1912.							
Apr. 28	H. J. E. Keys	1057	21	27·4	1·84	1·95	50
May 11	"	1057	63	279	1·50	6·05	*420
May 22	"	1057	54	178	1·36	5·20	*260
June 1	"	1057	26	68·8	1·75	3·11	121
June 24	"	1057	22	20·8	1·07	1·41	22·4
June 9	"	1057	26	27·7	1·46	1·98	55·1
July 1	"	1057	26	19·2	1·13	1·30	21·6
July 13	"	1057	26	29·1	1·40	1·72	39·0
July 14	"	1057	26	29·3	1·30	1·62	39·0
July 29	"	1057	26	23·1	1·26	1·48	29·1
Aug. 15	"	1057	22	20·3	1·20	1·44	24·5
Aug. 31	"	1057	24	18·0	1·09	1·20	19·5
Sept. 14	"	1057	24	14·5	1·04	1·24	15·1
Sept. 24	"	1057	24	14·6	0·82	1·18	12·1

*Made at different section.

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	June.		July.		August.	
	Gauge height.	Discharge	Gauge height	Discharge.	Gauge height.	Discharge
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·00	8·9	0·78	2·1
2			0·98	8·3	0·80	2·6
3	2·16	61·4	0·95	7·3	0·80	2·6
4	2·12	61·4	0·95	7·3	0·80	2·6
5	2·11	58·7	0·94	7·0	0·82	3·2
6	2·04	55·1	0·95	7·3	1·00	8·9
7	1·99	52·5	0·92	6·3	0·96	7·6
8	1·89	47·4	0·94	7·0	1·01	9·2
9	1·80	42·9	0·94	7·0	0·99	8·6
10	1·72	39·0	0·96	7·6	0 99	8·6
11	1·90	46·9	0·96	7·6	0·95	7·3
12	1·49	28·2	0·95	7·3	0·95	7·3
13	1·40	24·2	0·95	7·3	0·92	6·3
14	1·32	20·8	0·95	7·3	0·91	6·0
15	1·30	20·0	0·95	7·3	0·90	5·7
16	1·30	20·0	0·92	6·3	0·88	5·1
17	1·25	18·0	0·91	6·0	0·86	4·5
18	1·25	18·0	0·89	5·4	0·85	4·2
19	1·19	15·6	0·85	4·2	0·80	2·6
20	1·12	13·0	0·88	5·1	0·80	2·6
21	1·10	12·3	0·90	5·7	0·80	2·6
22	1·08	11·6	0·84	3·8	0·82	3·2
23	0·98	8·3	0·82	3·2	0·80	2·6
24	1·02	9·2	0·82	3·2	0·80	2·6
25	1·05	10·6	0·82	3·2	0·80	2·6
26	1·00	8·9	0·82	3·2	0·80	2·6
27	0·96	7·6	0·80	2·6	0·86	4·5
28	0·94	7·0	0·80	2·6	0·82	3·2
29	0·96	7·6	0·78	2·1	0·76	1·5
30	0·94	7·0	0·79	2·4	0·82	3·2
31			0·78	2·1	0·80	2·6

Guichon Creek, above Mamit Lake, for 1911.

September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
0·80	2·6	0·80	2·6	0·80	2·6	0·8	3·2	1
0·82	3·2	0·80	2·6	0·80	2·6	0·8	3·2	2
0·80	2·6	0·80	2·6	0·80	2·6	0·8	3·2	3
0·82	3·2	0·82	3·2	0·80	2·6	0·8	3·2	4
0·90	5·7	0·82	3·2	0·82	3·2	0·86	4·5	5
0·85	4·2	0·82	3·2	0·88	5·1	0·85	4·2	6
0·85	4·2	0·81	2·9	0·88	5·1	0·87	5·0	7
0·85	4·2	0·80	2·6	0·88	5·1	0·87	5·0	8
0·82	3·2	0·80	2·6	0·88	5·1	0·87	5·0	9
0·82	3·2	0·80	2·6	0·88	5·1	0·87	5·0	10
0·79	2·4	0·80	2·6	0·88	5·1	0·87	5·0	11
0·78	2·1	0·80	2·6	0·84	3·8	0·87	5·0	12
0·85	4·2	0·80	2·6	0·82	3·2	0·87	5·0	13
0·86	4·5	0·80	2·6	0·80	2·6	0·87	5·0	14
0·85	4·2	0·80	2·6	0·80	2·6	0·87	5·0	15
0·80	2·6	0·80	2·6	0·80	2·6	0·87	5·0	16
0·85	4·2	0·80	2·6	0·80	2·6	0·90	5·7	17
0·84	3·8	0·80	2·6	0·80	2·6	0·90	5·7	18
0·84	3·8	0·80	2·6	0·80	2·6	0·90	5·7	19
0·81	2·9	0·82	3·2	0·80	2·6	0·90	5·7	20
0·81	2·9	0·82	3·2	0·90	5·7	0·90	5·7	21
0·82	3·2	0·80	2·6	0·90	5·7	0·90	5·7	22
0·82	3·2	0·80	2·6	0·89	5·4	0·90	5·7	23
0·84	3·8	0·80	2·6	0·88	5·1	0·90	5·7	24
0·82	3·2	0·80	2·6	0·82	3·2	0·90	5·7	25
0·82	3·2	0·80	2·6	0·85	4·2	0·90	5·7	26
0·85	4·2	0·80	2·6	0·85	4·2	0·90	5·7	27
0·82	3·2	0·80	2·6	0·85	4·2	0·87	5·0	28
0·82	3·2	0·80	2·6	0·82	3·2	0·87	5·0	29
0·82	3·2	0·80	2·6	0·82	3·2	0·90	5·7	30
.....	....	0·80	2·6	.....	....	0·90	5·7	31

MONTHLY DISCHARGE of Guichon Creek, above Mamit Lake, for 1911.
(Drainage area, 315 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	61·4	7·0	26·2	0·08	0·09	1,559	
July	8·9	2·1	5·5	0·01	0·01	338	
August	9·2	1·5	4·5	0·01	0·01	277	
September	5·7	2·1	3·4	0·01	0·01	202	
October	3·2	2·6	2·7	0·01	0·01	166	
November	5·7	2·6	3·7	0·01	0·01	220	
December	5·7	3·2	5·0	0·01	0·01	307	
The period							11

NOTE.—Station was established June 3, 1911, after the freshet was past. Partial winter conditions existed from the middle of November to the end of the year. Gauge readings were taken, and the discharge estimated, allowing for the winter conditions.

Accuracy, "A" up to November 15. Accuracy "B" from November 15 to December 31.

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height.	Discharge.	Guage height.	Discharge.	Gauge height.	Discharge.	Guage height.	Discharge.	Guage height.	Discharge.	Guage height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	......	5·0	......	4·0	......	6·0	1·33	19·8	2·77	98	3·00	115
2	......	5·0	......	4·0	......	6·0	1·35	20·7	2·91	108	2·83	102
3	......	5·0	......	4·0	......	6·0	1·65	34·5	3·16	125	2·7[illegible]	94
4	......	5·0	......	5·0	......	6·0	1·61	32·5	3·35	135	2·53	84
5	......	5·0	......	5·0	......	6·0	1·50	27·0	4·00	180	2·40	76
6	......	4·0	......	5·0	......	6·0	1·57	30·5	4·48	215	2·38	75
7	......	4·0	......	5·0	......	6·0	1·65	34·5	4·98	260	2·18	63
8	......	4·0	......	5·0	......	6·0	1·60	32·0	5·18	285	2·13	60
9	......	4·0	......	5·0	......	6·0	1·62	33·0	5·38	305	1·99	52
10	......	4·0	......	5·0	......	7·0	1·75	39·5	5·58	330	1·87	45
11	......	4·0	......	5·0	......	7·0	1·68	36·0	5·78	360	1·78	41
12	......	3·0	......	5·0	......	7·0	1·55	29·5	6·02	410	1·70	37
13	......	3·0	......	5·0	......	7·0	1·57	30·5	6·05	420	1·68	36
14	......	3·0	......	5·0	......	7·0	1·68	36·0	6·05	420	1·67	35·5
15	......	3·0	......	5·0	......	7·0	1·67	35·5	6·10	430	1·71	37·5
16	......	3·0	......	5·0	......	7·0	1·65	34·5	6·12	435	1·80	42·0
17	......	3·0	......	5·0	......	7·0	1·58	31·0	6·10	430	1·81	42·5
18	......	2·0	......	5·0	......	7·0	1·57	30·5	6·00	410	1·75	39·5
19	......	2·0	......	5·0	......	7·0	1·45	25·0	5·89	380	1·62	33
20	......	2·0	......	5·0	......	7·0	1·40	23·0	5·65	340	1·64	34
21	......	2·0	......	5·0	......	7·0	1·53	28·5	5·39	310	1·59	31·5
22	......	2·0	......	5·0	......	7·0	1·50	27·0	5·26	290	1·53	28·5
23	......	2·0	......	5·0	......	7·0	1·56	30·0	5·10	275	1·48	26·2
24	......	2·0	......	5·0	......	7·0	1·55	29·5	5·05	270	1·40	23·0
25	......	2·0	......	5·0	......	10·0	1·55	29·5	4·55	220	1·35	20·7
26	......	2·0	......	5·0	......	11·0	1·55	29·5	4·47	215	1·30	18·5
27	......	3·0	......	5·0	......	10·0	1·85	44·5	4·15	190	1·25	16·8
28	......	4·0	......	5·0	......	8·0	1·92	48·1	3·78	165	1·21	15·3
29	......	4·0	......	5·0	......	9·0	2·18	62·8	3·50	145	1·26	17·1
30	......	4·0		....	......	10·0	2·45	79·0	3·27	130	1·28	17·8
31	......	4·0		....	......	15·0	......	......	3·15	125	......	..

Guichon Creek, above Mamit Lake, for 1912.

July.		August.		September.		October.		November.		Day.
Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
1·30	18·5	1·3	18·5	1·3	18·5	1·20	15·0	1·20	15·0	1
1·46	25·4	1·3	18·5	1·3	18·5	1·20	15·5	1·17	12·8	2
1·67	35·5	1·3	18·5	1·42	23·8	1·20	15·0	1·20	15·0	3
1·62	33	1·3	18·5	1·45	25·0	1·20	15·0	1·20	15·0	4
1·58	31	1·3	18·5	1·6	32·0	1·20	15·0	1·20	15·0	5
1·77	40·5	1·28	17·8	1·47	25·8	1·20	15·0	1·20	15·0	6
1·75	39·5	1·21	15·3	1·62	33·0	1·20	15·0	1·15	13·0	7
	37·5	1·20	15·0	1·55	29·5	1·20	15·0	1·15	13·0	8
1·67	35·5	1·20	15·0	1·47	25·8	1·20	15·0	1·20	15·0	9
1·6	32·0	1·20	15·0	1·4	23·0	1·20	15·0	1·20	15·0	10
1·61	32·5	1·51	27·5	1·4	23·0	1·20	15·0	1·20	15·0	11
1·75	39·5	1·63	33·5	1·36	21·2	1·25	17·0	1·22	15·7	12
1·72	38·0	1·38	22·1	1·31	19·0	1·25	17·0	1·27	17·4	13
1·63	33·5	1·41	23·4	1·26	17·1	1·22	15·7	1·20	15·0	14
1·56	30	1·57	30·5	1·20	15·0	1·20	15·0			15
1·47	25·8	1·47	25·8	1·20	15·0	1·20	15·0			16
1·41	23·4	1·54	29·0	1·20	15·0	1·40	23·0			17
1·33	19·8	1·58	31·0	1·20	15·0	1·60	32·0			18
1·3	18·5	1·62	33·0	1·16	13·4	1·20	15·0			19
1·41	23·4	1·84	44·0	1·15	13·0	1·20	15·0			20
1·45	25·0	1·65	34·5	1·13	12·2	1·21	15·3			21
	26·0	1·58	31·0	1·14	12·6	1·20	15·0			22
	27·0	1·60	32·0	1·15	13·0	1·22	15·7			23
1·52	28·0	1·61	32·5	......	12·3	1·20	15·0			24
1·60	32·0	1·44	24·6	.....	11·6	1·20	15·0			25
1·8	42·0	1·36	21·2	1·10	11·0	1·20	15·0			26
1·65	34·5	1·3	18·6	1·12	11·8	1·20	15·0			27
1·53	28·5	1·3	18·5	1·15	13·0	1·20	15·0			28
1·46	25·4	1·26	17·1	1·15	13·0	1·20	15·0			29
1·42	23·8	1·25	16·8	1·15	13·0	1·20	15·0			30
1·36	21·2	1·3	18·5	......	....	1·20	15·0			31

MONTHLY DISCHARGE of Guichon Creek, above Mamit Lake, for 1912.

(Drainage area, 315 square miles.)

Month.	Discharge in Second Feet.				Run-Off.		Rain-fall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	5·0	2·0	3·3	0·01	0·01	203	
February	5·0	4·0	5·0	0·01	0·01	288	
March	15·0	8·0	7·5	0·02	0·02	461	
April	79	19·8	34·1	0·11	0·1	2,030	
May	435	9·8	271	0·86	1·0	16,660	
June	115	17·1	45·3	0·14	0·2	2,700	
July	40·5	18·5	29·9	0·09	0·1	1,840	
August	44	15	23·7	0·07	0·1	1,490	
September	33	11	18·2	0·06	0·06	1,080	
October	32	15	1[illegible]	0·05	0·06	984	
The period							

NOTE.—During January, February and March, winter conditions existed. Gauge readings w[illegible] taken, and discharges were estimated allowing for ice conditions.

Accuracy "B" during January, February and March. Accuracy "A" during the open season.

HAT CREEK (216-218.)

Hat creek is an important and contentious irrigation stream, in the Dry Belt [illegible] British Columbia. It rises in the hills about 15 miles west of Ashcroft, in the Hat Creek Forest Reserve, at an elevation of about 4,300 feet; and, after flowing northerly for nearly 40 miles, discharges into Bonaparte river from the west, about 14 miles from Ashcroft, at an elevation of about 2,000 feet.

It is part of the Bonaparte-Thompson drainage. The drainage area of Hat creek above the mouth is about 240 square miles, and above the Hammond diversion [illegible] about 47 square miles.

The creek varies in width from 15 to 20 feet, and is from 1 to 3 feet deep.

The precipitation at the mouth is only about from 9 inches to 10 inches, while [illegible] Upper Hat creek it probably is from 10 inches to 12 inches.

The summers are quite hot and generally dry, the evenings being cool. The winters are long and severe. The snowfall in Upper Hat creek is about 4 feet, but is less near the mouth.

Hat Creek valley is mostly timbered with bull pine, poplar and some willow, [illegible] a few open patches of land.

The hills are mostly open range lands, or timbered with bull pine, jack p[illegible] spruce and fir.

The valley varies in width from one mile to several hundred yards. The hills [illegible] the upper part of the watershed rise to a height of 5,000 feet above the sea.

The upper bench lands, owing to their elevation above Hat creek, cannot be irrigated from the main stream, and several of the small tributaries are used, but [illegible] supply of water is not sufficient to give promise of much future development.

In the valley there are a number of good farms and ranches, all requiring irr[illegible]tion. The soil is mostly a sandy loam, with sandy and gravelly subsoil. Near [illegible] lower part of the valley, fruit is successfully grown, but in the upper valley of [illegible] creek ranching and mixed farming must be resorted to.

Hat Creek ranch at the mouth of Hat creek uses water for irrigation. Water is also used by Robertson, Duck (Chinaman) Parke, Darragh, Smith, Pocock, King, and Colley, while the Indians in the lower valley use a little. In Upper Hat creek the growing season is short, and not as much water is necessary as near the mouth.

Exclusive of several water records on small tributaries there is a total of 8,450 miner's inches (237 c.f.s.) recorded on Hat creek. Many of these records, appurtenant to land in Bonaparte valley, have never been used nor probably will be, owing to impracticability and the heavy expense involved in the construction of the necessary irrigation works. It is probable that many of these old records will be cancelled by the British Columbia Board of Investigation.

There are also several water records allowing the diversion of water from Upper Hat creek into the Oregon Jack creek divide, for use on lands near Ashcroft.

Mr. W. H. Hammond, who owns the Basque ranch, holds the Minnaberriet and Langley records for about 600 miner's inches dated 1871 and 1883; and diverts water from Upper Hat creek at Colley's homestead. His canal is about 2 miles long, and delivers the water into the Oregon Jack Creek Divide reservoir site, whence it gradually seeps into Oregon Jack creek, and down that stream to Hammond's ditch to Basque ranch. A considerable amount of this water is lost through seepage, percolation and evaporation in the swampy reservoir.

From June 17 to September 26, 1911, the Hammond diversion was opened, and about 1,400 acre-feet were diverted. The maximum quantity at any time was 11 c.f.s.

In 1912 the diversion was open from May 9 to August 26, during which time about 1,800 acre-feet were taken from the stream.

See discharge of Hammond's ditch for 1912, hereinafter.

The Ashcroft Water, Electric and Improvement Company also holds a record from Upper Hat creek for 1,000 miner's inches, dated 1906, allowing the diversion of the surplus waters of Hat creek, said waters to be stored in the same Oregon Jack Creek Divide reservoir, then taken down Oregon Jack creek, to be used on certain lands west and north of Ashcroft.

This record has never been operated, and there is a dispute between this company and the owner of the Basque ranch regarding the rights to use the Oregon Jack Creek Divide reservoir.

The company proposes to construct large storage works, dams, etc., sufficient to store from 8,000 to 10,000 acre-feet. This would be a very expensive undertaking, and it is doubtful if sufficient water could be obtained from Upper Hat creek to justify the expense. In 1911, the total run-off of Upper Hat creek at Hammond's diversion was slightly less than 5,000 acre-feet. In 1912 it was 5,600 acre-feet. These are only average years, but it is doubtful if the total yearly flow ever exceeds 7,000 or 8,000 acre-feet.

The dispute between the two rival record holders will have to be settled by the British Columbia Board of Investigation. In the meantime the reservoir, which is Dominion land, has not been granted to either applicant.

Hat creek has many small tributaries, viz.: (from the left going upstream), Boundary, Parks, Cattle, Medicine, and Blue-earth creeks; (from the right going upstream) Graves, Anderson, Pocock, King, and Colley creeks. Miscellaneous measurements of discharge have been taken on several of these tributaries.

At the head of Blue-earth creek, which enters above Hammond's diversion, is a small storage lake, Blue-earth lake. For details of Blue-earth reservoir, *see* 'Blue-earth Creek.'

There have been several hydrographic stations established on Hat creek, viz.: Hat creek (at Colley's ranch), Hammond's ditch, and Hat creek (at Hat Creek ranch, near mouth). These are all discussed separately hereinafter.

Numerous miscellaneous measurements have been taken for special investigation. At Pocock's ranch, about a mile or so below Hammond's diversion, measurements were made to ascertain the amount of water that sinks between these two points.

Measurements were also made at Hat Creek ranch showing the quantity of water used there for irrigation.

Measurements were taken to find the loss in the Hammond ditch between the intake and the reservoir in Oregon Jack divide.

Hat Creek, at Colley's Ranch (216).

This station was established on April 22, 1911, by E. M. [illegible] There are two gauges. One is several hundred yards below Hammond's intake, and just [illegible] Colley creek. It is a standard vertical staff gauge, 8 feet long [illegible] on the left bank of Hat creek. It is referred to three bench-[illegible]

The second gauge is about 100 yards above Hammond's [illegible] vertical staff gauge near the right bank. It is referred [illegible]

The lower gauge only is read when Hammond's di[illegible] whole flow of upper Hat creek is recorded. When the [illegible] the lower gauge registers the amount of water not dive[illegible]

The upper gauge is read only when the Hammond [illegible] register the whole discharge of Upper Hat creek.

When Hammond's headgate is closed, all measurements are made [illegible] of the intake, which is a timber flume 14 feet wide with level p[illegible] and ver-tical sides. Measurements are made with small electric current [illegible] with wading rods.

When the headgate is open, measurements are made by the wading method, just above and below the intake.

Hat Creek, in Hammond's Ditch (217).

Hammond's ditch diverts water from Upper Hat creek at Colley's ranch, about 22 miles from the mouth of the stream. It discharges the water into a large swampy reservoir in the divide between Hat creek and Oregon Jack creek, whence the water runs into Oregon Jack creek, and is used for irrigation on the Basque ranch, southwest of Ashcroft, in the Thompson drainage area. A large quantity of the water diverted by Hammond's ditch is lost by seepage and evaporation in the so-called reservoir before it reaches Oregon Jack creek.

The ditch is nearly two miles long. It is mostly side-hill ditch, with several lengths of timber fluming. It runs along the lower contour of the hills to the south of the divide. The ditch is about 6 feet wide and 2 feet deep. It has a maximum capacity of about 20 c.f.s. The greatest quantity that has yet been diverted at any time is 14 c.f.s., the mean velocity being only 1·5 feet per second.

A regular gauging station was established in Hammond's ditch on May 9, 1912, and the readings were taken until after the headgate was closed on August 26.

The gauge is a vertical staff fastened to the side of the overflow spillway, about 10 feet below the overflow sluiceway, and 100 yards below the intake. The zero of the gauge is referred to one bench-mark.

The meter measurements were made in the spillway box, by means of a current meter attached to a wading rod.

The results of this station show that between May 9, and August 26, 1912, some 1,775 acre-feet were diverted through Hammond's ditch.

In 1911, the amount of water diverted was computed from the difference between the daily discharges recorded by the upper and lower gauges at the gauging station at Colley's ranch. Between June 16 and September 26 about 1,400 acre-feet were diverted.

DISCHARGE MEASUREMENTS of Hat Creek, at Colley's Ranch, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft	Ft. per sec	Feet.	Sec.-ft.
May 7	E. M. Dann	268	14	15·3	0·76	1·50[1]	11·7
May 15	"	268	14	15·2	1·2	1·61[1]	18·2
May 17	"	268	14	19·1	1·5	1·78[1]	28·7
May 29	"	268	14	21	2·1	1·98[2]	43·5
May 30	"	268	14	24·7	2·6	2·25[3]	75·1
May 31	"	268	14	28·5	3·3	2·31[4]	92·6
July 18	C. G. Cline	1046	8	2·2	0·3	1·07[1]	0·6
Sept. 29	"	1046	16	5·9	0·86	1·31[1]	5·1
April 22	E. M. Dann	268				...[6]	4·4
April 28	"	268	10	5·2	0·9	0·16[5]	4·7
May 2	"	268	11	8·3	1·55	0·39[5]	13·0
July 18	C. G. Cline	1046	11	5	0·97	0·16[5]	4·8
Sept. 30	"	1046	13	4·8	0·75	0·15[5]	3·6
1912.							
May 11	C. G. Cline	1046	11	19·8	3·1	2·15[1]	62·0
June 17	B. Corbould	1046	15	5·85	0·8	1·31[1]	4·7
July 11	"	1044	6	3·2	0·6	1·21[1]	1·9
July 31	"	1044	6	3·2	0·5	1·2[1]	1·6
Aug. 19	"	1044	6	2·7	0·4	1·19[1]	1·2
May 14	C. G. Cline	1046	17	21·7	4·0	1·40[5]	87·0
June 17	B. Corbould	1046	12·5	7·5	1·59	0·38[5]	12·0
July 11	"	1044	12·5	8·4	1·9	0·42[5]	15·9
July 31	"	1044	12	5·4	0·98	0·23[5]	5·3
Aug. 19	"	1044	12	6·36	1·4	0·30[5]	9·4

[1]Lower gauge.
[2]Lower gauge, upper gauge, 0·97.
[3]Lower gauge, upper gauge, 1·57.
[4]Lower gauge, upper gauge, 1·41.
[5]Upper gauge.
[6]No gauge height.

Daily Discharge of Hat Creek, at Colley's Ranch, for 1911.

Day.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1	....	11·0	59·8	12·0	1·0	2·0	5·0	3·9	2·2
2	....	13·0	46·9	12·0	1·0	2·0	4·0	3·9	2·4
3	....	13·0	36·0	12·0	1·0	4·0	4·5	3·9	2·4
4	....	12·5	26·5	12·0	1·0	7·5	4·0	4·6	2·4
5	....	12·5	24·5	12·0	1·0	9·5	4·5	5·1	2·5
6	....	12·0	23·0	12·0	1·5	9·5	4·0	4·8	2·5
7	....	12·0	10·5	12·0	7·5	7·5	4·5	4·6	2·4
8	....	11·2	23·0	12·0	14·0	5·5	4·0	4·1	2·4
9	....	10·0	21·0	12·0	9·5	5·5	4·0	3·9	2·2
10	....	10·8	22·0	12·0	7·5	5·5	4·0	3·4	2·2
11	....	12·5	24·5	12·0	5·5	4·0	4·0	2·5	2·2
12	....	12·0	26·5	14·0	5·5	5·5	4·0	2·2	2·4
13	....	16·0	23·0	12·0	5·5	9·5	4·5	1·9	2·4
14	....	15·0	19·5	12·0	5·5	7·5	4·0	2·2	2·5
15	....	28·6	12·0	9·5	5·5	5·5	4·5	2·1	2·7
16	....	33·0	10·5	9·5	5·5	5·5	4·5	2·2	3·2
17	....	28·6	11·0	5·5	4·0	7·5	4·0	2·4	3·4
18	....	25·1	12·0	5·5	4·0	5·5	4·0	2·5	3·6
19	....	27·2	14·0	4·0	4·0	5·5	4·5	2·2	3·4
20	....	25·8	14·0	4·0	4·0	5·5	4·3	1·9	3·4
21	....	30·8	14·0	4·0	4·0	5·5	4·3	1·7	3·2
22	4·4	25·1	14·0	5·5	4·0	5·5	3·9	1·9	3·2
23	4·4	20·0	14·0	4·0	4·0	5·5	4·3	2·2	5·2
24	4·5	18·2	12·0	4·0	4·0	5·5	3·9	2·7	3·4
25	4·5	18·2	12·0	4·0	4·0	5·5	3·6	2·5	3·4
26	4·6	17·0	12·0	4·0	4·0	5·5	4·7	2·4	3·9
27	4·6	18·2	12·0	4·0	4·0	4·0	4·1	2·4	3·9
28	4·7	18·2	12·0	4·0	2·0	4·0	4·4	2·2	4·1
29	6·0	18·2	12·0	5·5	2·0	4·0	4·1	2·2	4·1
30	8·0	55·0	12·0	5·5	2·0	4·0	4·4	2·4	4·3
31	....	62·2	....	5·5	2·0	....	3·9	....	4·3

Monthly Discharge of Hat Creek, at Colley's Ranch, for 1911.
(Drainage area, 47 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	92·6	10·0	20·7	0·44	0·51	1,275	
June	59·8	10·5	19·5	0·42	0·46	1,162	
July	14·0	4·0	8·3	0·18	0·21	510	
August	14·0	1·0	4·2	0·1	0·11	258	
September	9·5	2·0	5·6	0·12	0·13	333	
October	5·0	3·6	4·2	0·1	0·11	258	
November	5·1	1·7	2·9	0·06	0·07	173	
December	4·3	2·2	3·0	0·06	0·07	184	
The period. Estimated	....	....	6·6	0·14	2·0	5,000	1[illegible]

Note.—The station was established on April 22. The mean discharge for April was less than 4 c.f.s. The discharges between June 17 and September 26 are taken from the curve of the gauge above Hammond's diversion (upper gauge), as during that period the Hammond headgate was open, and water was diverted to Oregon Jack Creek divide. The remaining discharges are taken from the station below Hammond's diversion (lower gauge). Winter conditions existed during the month of December. The maximum recorded stage of 2·31 feet occurred about 5 p.m. on May 31, and was 92·6 c.f.s. The mean for the day, however, was only 62·2 c.f.s.

Accuracy, "A."

Daily Discharge of Hat Creek, at Colley's Ranch, for 1912.

Day.	January.	February.	March.	April.	May.	June.	July.	August	September.	October.	November.
	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1	4·8	2·7	1·7	1·7	9·6	23·0	13·0	8·6	5·4	5·0	4·0
2	4·6	2·7	1·7	1·9	11·6	19·0	26·5	6·6	6·2	5·0	4·0
3	4·3	2·7	1·7	1·9	12·5	18·0	23·5	6·2	7·4	5·4	4·0
4	4·3	2·3	1·9	2·2	11·6	17·5	19·5	6·2	6·6	5·6	4·0
5	4·3	2·3	1·9	2·2	13·5	17·0	18·0	6·2	6·2	6·0	4·0
6	4·3	2·0	1·9	2·2	14·5	15·0	17·0	6·6	6·2	5·5	4·0
7	4·1	2·0	1·9	2·2	33·0	14·0	19·0	6·2	7·0	5·0	4·0
8	4·1	2·0	1·9	2·3	30·0	14·5	16·0	7·4	6·6	5·0	4·0
9	3·9	2·0	2·0	2·2	30·4	13·0	15·0	8·2	5·8	4·5	4·0
10	3·9	2·0	2·0	2·2	29·2	12·2	14·5	7·4	5·0	4·5	4·0
11	3·9	1·9	2·0	2·2	37·5	12·2	13·5	7·4	4·8	4·5	4·0
12	4·1	1·9	2·2	2·5	29·8	11·4	14·5	7·4	4·8	4·5	4·0
13	3·9	1·7	2·2	2·2	32·2	11·0	15·5	6·6	4·5	5·0	4·0
14	3·9	1·7	2·0	2·3	65·0	11·0	13·0	6·6	4·5	4·5	4·5
15	3·6	1·7	2·0	2·2	50·0	10·6	13·0	9·8	4·5	4·5	4·0
16	3·6	1·7	1·9	2·3	40·3	11·4	12·6	8·2	4·5	4·5	4·0
17	3·4	1·7	1·9	2·2	27·0	12·2	12·6	8·2	4·2	5·0	4·0
18	5·4	1·6	1·9	2·5	25·5	12·6	11·8	11·8	3·7	5·0	4·0
19	3·2	1·7	1·6	2·5	27·0	15·0	11·8	9·0	3·7	5·0	......
20	3·0	1·7	1·6	2·9	28·6	13·0	11·4	8·2	3·7	5·0	..
21	2·7	1·7	1·6	2·7	43·8	13·5	10·6	7·4	3·7	5·0	
22	3·0	1·6	1·9	3·4	44·5	15·5	10·2	7·0	3·7	5·0	
23	3·2	1·7	1·9	3·9	47·3	13·0	10·6	6·2	3·7	4·5	
24	3·2	1·7	1·9	4·8	37·5	12·6	11·8	6·2	4·2	4·5	
25	3·9	1·7	1·7	4·6	36·1	11·8	10·2	5·5	3·7	4·5	
26	3·9	1·9	1·7	6·0	30·4	11·0	9·4	5·8	3·7	4·0	
27	4·1	1·9	1·7	6·7	27·0	11·0	8·2	4·8	3·7	4·0	
28	3·9	1·9	1·7	8·0	26·5	11·4	7·4	6·2	5·7	4·0	
29	3·6	1·9	1·6	8·0	25·5	11·0	7·4	5·0	4·0	4·0	
30	3·6	....	1·6	8·8	27·5	12·6	6·6	4·8	3·7	4·0	
31	3·2	...	1·6	.....	22·0	.	6·2	5·0		4·0	

Monthly Discharge of Hat Creek, at Colley's Ranch, for 1912.
(Drainage area, 47 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
January	4·8	2·7	3·8	0·08	0·09	232	
February	2·7	1·6	1·9	0·01	0·04	111	
March	2·2	1·6	1·8	0·01	0·05	112	
April	8·8	1·7	3·4	0·07	0·08	202	
May	65·0	9·6	29·9	0·6	0·7	1,838	
June	23·0	10·6	13·5	0·3	0·33	803	
July	26·5	6·2	13·1	0·3	0·35	805	
August	11·8	4·8	7·0	0·15	0·2	430	
September	7·4	3·7	4·8	0·1	0·1	286	
October	6·0	4·0	4·7	0·1	0·1	289	
November	4·5	4·0	4·0	0·09	0·1	238	
December (estimated)	..		4·0	0·09	0·1	246	
The year	96	1·6	7·6	0·16	2·2	5,592	12

Note.—Winter conditions existed during January, February and part of March. The maximum recorded storage of 1·44 (gauge height on upper gauge) took place at 8.15 p.m. on May 11, and was 96 c.f.s. This lasted only for a few hours. The mean for that day was 65 c.f.s. Hammond's headgate was opened on May 9, and closed on August 26. Discharges up to May 8 are taken from lower gauge; after May 8 they are taken from the upper gauge, except during October and November, when they are again read from the lower gauge. See also discharges in Hammond's ditch hereinafter.

Accuracy, "A."

DISCHARGE MEASUREMENTS of Hat Creek, in Hammond's Ditch, for 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
July 18	C. G. Cline	1046	6	3·0	1·5	[1]	4·5
1912.							
June 17	Cline and Corbould	1046	6·5	5·8	1·1	0·85	6·8
July 11	B. Corbould	1046	4·2	4·2	2·7	1·05	11·4
July 11	"	1044	4·7	2·8	2·6	0·8	7·2
July 11	"	1044	2·3	0·5	0·9	0·39	0·5
July 12	"	1044	6·0	4·3	3·0	1·20	12·9
July 12	"	1044	4·2	1·3	1·24	0·49	1·6
July 12	"	1044	6·0	4·0	2·8	0·99	11·1
July 12	"	1044	5·0	2·6	2·0	0·71	5·2
July 12	"	1044	5·8	3·6	2·7	0·92	9·8
July 31	"	1044	4·2	1·6	1·2	0·60	1·8
July 31	"	1044	5·2	2·7	2·3	0·78	6·3
Aug. 19	"	1044	4·1	3·0	2·4	0·89	7·2
Aug. 19	"	1044	4·0	3·1	1·8	[2]	5·9

[1] No gauge height.
[2] Measured at outlet into reservoir, showing loss of 1·3 c.f.s. in 2 miles.

DAILY DISCHARGE of Hat Creek, in Hammond's Ditch, for 1912.

Day.	May.	June.	July.	August.
	Discharge.	Discharge.	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1		10·5	11·2	5·8
2		10·2	11·2	5·4
3		10·2	12·3	5·2
4		10·2	12·3	5·2
5		9·8	13·2	5·2
6		9·5	13·0	5·6
7		9·5	14·0	4·8
8		9·5	13·0	5·2
9	5·3	9·8	12·0	5·8
10	5·5	9·8	11·3	5·4
11	4·5	9·8	11·3	5·4
12	4·0	9·5	11·2	5·4
13	4·0	7·6	11·2	4·9
14	8·6	7·6	11·0	4·9
15	6·0	7·4	11·0	5·6
16	6·0	7·4	10·8	5·2
17	5·0	6·4	10·5	5·2
18	5·0	6·4	10·2	9·5
19	5·5	9·0	10·2	7·4
20	5·6	9·5	9·5	7·0
21	10·0	10·2	9·0	6·4
22	10·8	10·2	8·6	·0
23	10·5	9·5	8·3	·0
24	10·8	9·8	8·3	5·0
25	10·5	9·8	7·6	4·8
26	10·2	9·5	7·2	·0
27	10·8	10·0	6·4	·0
28	11·0	9·8	6·0	0
29	10·8	10·5	5·6	·0
30	9·8	11·2	5·6	0
31	10·8		5·3	·0

MONTHLY DISCHARGE of Hat Creek, in Hammond's Ditch, for 1912.

Month.	Discharge in Second-Feet.			Run-Off.
	Maximum	Minimum	Mean.	Total in acre-feet.
May	11·0	4·0	5·8	356
June	11·2	6·4	9·3	553
July	14·0	5·3	9·9	608
August	9·5	0	4·2	258

Total quantity of water diverted = 1,775.
NOTE.—Accuracy "B."

HAT CREEK AT HAT CREEK RANCH, UPPER STATION (218).

A station was established on Hat creek at Hat Creek ranch near the mouth of the creek, on May 9, 1911, by E. M. Dann. The station was located just above the irrigation intake of Hat Creek ranch. Gauge No. 2 was drowned out by the construction of a temporary diverting dam just below the gauge, on June 18, 1912, and gauge No. 3 was set in place thereof. Gauge No. 3 is a vertical staff, 4 feet long, and it is fastened to a small tree, on the left bank, near the wagon road leading from the Cariboo road to Lillooet. It is about one-quarter mile from the Cariboo road, and the same distance from Hat Creek ranch house. The gauge is referred to three bench-marks. Measurements are made with a current meter, by wading. The channel at the station is straight, with good control below the station. The bed of the stream is gravel, with some mud. The banks are from 3 to 4 feet high. The right bank is covered with thick brush, and the left bank is open. There is but one channel at all stages, and it is not inclined to overflow.

All discharges up to June 18, 1912, are taken from a rating curve of the old gauge No. 2. From that date they are taken from gauge No. 3.

The gauge readings are made daily by the Hat Creek Ranch foreman. The station was maintained during the irrigation season only.

DISCHARGE MEASUREMENTS of Hat Creek, at Hat Creek Ranch (Upper Station,) 1911-12

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft
June 11	E. M. Dann	268	33·5	46·5	3·4	2·05[1]	159
May 14	"	268	.		..	1·05[1]	28·[illegible]
July 21	C. G. Cline	1046	12	4·2	1·4	0·42[1]	5·[illegible]
Sept. 28	"	1046	26	17·1	0·9	0·89[1]	16·[illegible]
1912.							
April 25	"	1046	24	18·4	1·0	0·92[1]	19·0
May 9	"	1046	28	41·4	2·4	1·83[1]	105
May 15	"	1016	30	60·9	3·6	2·35[1]	222
June 16	"	1046	26	31·1	1·3	1·38[1]	39·[illegible]
July 12	B. Corbould	1044	27	24·6	2·4	7·38[2]	58·[illegible]
July 30	"	1044	27	22·2	1·5	7·10[2]	33
August 27	"	1044	26	20·7	1·4	7·05[2]	28·[illegible]

[1]Gauge No. 2.
[2]Gauge No. 3.

DAILY GAUGE HEIGHT AND DISCHARGE of Hat Creek, at Hat Creek Ranch (Upper Station), for 1911.

Day.	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Discharge.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·0	141	1·0	22	0·35	5
2			2·1	163	0·9	18	0·4	6
3			1·9	120	0·9	18	0·4	6
4			1·7	83	0·8	15	0·4	6
5			1·6	68	0·8	15	0·4	6
6			1·5	55	0·8	15	0·6	10
7			1·5	55	0·7	12	1·05	24
8			1·5	55	0·7	12	1·25	34
9	1·15	28	1·5	55	0·7	12	1·25	34
10	1·1	26	1·5	55	0·8	15	1·2	31
11	1·1	26	1·5	55	0·8	15	1·1	26
12	1·15	28	1·8	100	0·75	14	1·0	22
13	1·15	28	1·8	100	0·7	12	0·9	18
14	1·2	31	1·7	83	0·65	11	0·8	15
15	1·2	31	1·6	68	0·75	14	0·8	15
16	1·5	55	1·5	55	0·65	11	0·85	16
17	1·5	55	1·4	45	0·65	11	0·8	15
18	1·5	55	1·3	38	0·6	10		
19	1·5	55	1·2	31	0·6	10		
20	1·5	55	1·2	31	0·6	10		
21	1·6	68	1·2	31	0·5	8		
22	1·55	62	1·1	26	0·55	9		
23	1·4	45	1·1	26	0·5	8		
24	1·35	42	1·05	24	0·5	8		
25	1·3	38	1·0	22	0·5	8		
26	1·3	38	1·0	22	0·45	7		
27	1·3	38	0·9	18	0·4	6		
28	1·3	38	0·9	18	0·4	6		
29	1·35	42	0·9	18	0·4	6		
30	1·6	68	1·0	22	0·35	5		
31	1·9	120			0·35	5		

MONTHLY DISCHARGE of Hat Creek, at Hat Creek Ranch (Upper Station), for 1911.
(Drainage area, 240 square miles.)

Month.	Discharge in Second Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet.	Rainfall. Inches.
	120	26	46·6	0·19	0·22	2,865	
	163	18	58·1	0·23	0·26	3,338	
	22	5	11·2	0·05	0·06	688	
							10
The period .							

NOTE.—For 1911 gauge No. 2 was used. See note on 1912 sheet for gauge No. 3. Owing to the diversion of water in Hammond's ditch near the headwaters of Hat creek, this station does not give the total run-off of the stream.
Accuracy "A."

DAILY DISCHARGE of Hat Creek, at Hat Ranch (Upper Station), for 1912.

Day.	April.	May.	June.	July.	August.
	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1		22	83	48	[illegible]
2		26	83	50	[illegible]
3		26	68	54	
4		26	55	61	
5		22	55	71	
6		31	45	78	
7		55	38	90	
8		68	38	86	
9		83	38	72	
10		83	31	58	
11		141	31	49	
12		187	31	56	
13		120	51	52	
14		163	40	52	
15		187	40	39	
16		187	40	39	
17		212	40	38	
18		163	40	35	
19		141	39	30	
20		141	39	38	
21		187	39	40	
22		200	39	43	
23		212	39	37	
24		212	39	39	
25	18	187	41	40	
26	18	163	41	49	
27	18	163	42	47	
28	18	141	43	39	
29	22	120	44	32	
30	22	110	44	32	
31		100		32	

MONTHLY DISCHARGE of Hat Creek, at Hat Creek Ranch (Upper Station), for 1912.
(Drainage area, 240 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	212	22	125·1	0·52	0·60	7,686	
June	83	31	43·9	0·18	0·20	2,582	
July	90	32	46·2	0·19	0·22	2,841	
The period							1[illegible]

NOTE.—Measurements up to June 18, 1912, were made at gauge No. 2. At that date it was found [illegible] a temporary diverting dam had been thrown across the stream below the gauge, and it was affecting [illegible] height of the water at the gauge. So gauge No. 3 was established higher up the creek, and No. 2 w[illegible] abandoned. Owing to the diversion of water in Hammond's ditch near the headwaters of Hat cre[illegible] this station does not give the total run-off of the stream.

Accuracy "A."

HAT CREEK, AT HAT CREEK RANCH, LOWER STATION (269).

A station was established on Hat creek at Hat Creek ranch near the mouth of the creek, below all diversions, on May 9, 1911, by E. M. Dunn. The object of the station was to determine how much water of Hat creek was unused during the irrigation season, on account of the contention on this over-recorded stream. The station also gives the quantity of water used by Hat Creek ranch, by subtracting the discharges from the upper station (No. 218).

The gauge (No. 1) was placed at the lower side of the bridge on the Cariboo road, on the right bank. The datum of the gauge was referred to three bench-marks. The measurements were made by a current meter, by wading at a section just above the bridge.

This station was maintained during the irrigation season of 1911, and then abandoned.

For the discharge measurements made at this station see the list of miscellaneous measurements of discharge.

DAILY GAUGE HEIGHT AND DISCHARGE of Hat Creek, at Hat Creek Ranch (Lower Station), for 1911.

Day.	May.		June.		July.		August.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
			2·00	116·5	1·10	21·5	0·55	0·9
			2·10	129·5	1·00	17·0	0·55	0·9
			2·00	116·5	1·00	17·0	0·50	0·5
			1·60	68·5	0·90	12·0	0·50	0·5
			1·45	53·0	0·90	12·0	0·50	0·5
			1·40	48·0	0·90	12·0	0·70	4·5
			1·40	48·0	0·80	8·0	1·00	17·0
			1·40	48·0	0·80	8·0	1·20	30·5
	0·95	14·5	1·40	48·0	0·80	8·0	1·20	30·5
	0·90	12·0	1·40	48·0	0·90	12·0	1·15	27·0
	0·95	14·5	1·60	68·5	0·90	12·0	1·10	21·5
	1·00	17·0	2·00	116·5	0·85	10·0	1·05	20·0
	1·00	17·0	2·00	116·5	0·80	8·0	1·00	17·0
	1·05	20·0	1·80	92·0	0·75	6·0	0·90	12·0
	1·10	23·5	1·80	92·0	0·70	4·5	0·85	10·0
	1·50	58·0	1·70	80·0	0·60	1·4	0·90	12·0
	1·55	63·5	1·50	58·0	0·55	0·9	0·90	12·0
	1·50	58·0	1·40	48·0	0·50	0·5		
	1·45	53·0	1·30	39·0	0·40	0		
	1·50	58·0	1·25	35·0	0·40	0		
	1·60	68·5	1·25	35·0	0·40	0		
	[illegible]55	63·0	1·20	30·5	0·55	0·9		
	1·40	48·0	1·15	27·0	0·55	0·9		
	1·35	13·5	1·10	23·5	0·55	0·9		
	1·30	39·0	1·10	23·5	0·55	0·9		
	1·30	39·0	1·10	23·5	0·60	1·4		
	1·30	39·0	1·00	17·0	0·60	1·4		
	1·30	39·0	1·00	17·0	0·55	0·9		
	1·30	39·0	1·00	17·0	0·55	0·9		
	1·60	68·5	1·10	23·5	0·60	1·4		
	1·90	104·	...	...	0·60	1·4	....	

MONTHLY DISCHARGE of Hat Creek, at Hat Creek Ranch (Lower Station), for 1911.

Month.	Discharge in Second-Feet.			Run-Off
	Maximum.	Minimum.	Mean.	Total in acre-feet.
May	104	12	43·4	2,662
June	129	17	56·9	3,385
July	23	0	5·9	363

NOTE.—This station is below all diversions, and shows the amount of water in Hat Creek that was unused.

Accuracy, "B."

HEFFERLY CREEK (236, 237, 238 and 239.)

Hefferly creek (sometimes called Heffly creek) has its source in Hefferly lake, near the divide into Louis creek, at an elevation of 3,100 feet, and flowing westerly empties into North Thompson river, near Hefferly Creek post office, about 14 miles from Kamloops), at an elevation of 1,150 feet. The stream is about 10 miles long, from 15 to 25 feet wide, and from 6 inches to 2 feet deep. Hefferly lake is about 2 miles long and several hundred yards wide, and is used as a storage reservoir for irrigation purposes. The water users have co-operated and constructed a small dam at the outlet of the lake, and the spring freshet is mostly conserved. It is not possible to greatly increase the capacity of the reservoir without damming the easterly end of the lake as well, on account of the low divide into Louis creek.

Hefferly creek, like so many of the streams in the Dry Belt, is vastly over-recorded for irrigation purposes, but by storage and careful use there is enough water for all the lands in the valley and at the mouth. The earliest records are appurtenant to the Austen and Anderson places, near the mouth of the creek, and the waters of the creek are used mostly on these low lands. The Anderson interests have recently been formed into the North Thompson Ranching Company, and it is proposed to construct a high line canal, beginning near the lake, and irrigate several thousand acres of sloping bench lands on the south side of the Hefferly valley. Austen owns a large tract of land at the mouth of the creek, and has purchased some of Anderson's bottom lands. There are several small farms in the valley, but they depend on the water that is not required by Anderson and Austen.

The hills of the Hefferly drainage rise to a height of 4,000 feet, and are fairly well covered with timber, bull pine, jack pine and some fir. The upper slopes are excellent range lands.

The precipitation of Hefferly drainage is probably about 20 inches near the headwaters, which rise near Louis creek and the easterly limit of the Dry Belt. At the mouth of the creek the precipitation is not more than 10 inches per annum, with only a small rainfall during the growing season.

Hefferly Creek, below Hefferly Lake (237, 238 and 239.)

This gauging station is a combination of three stations, viz.: Hefferly creek, upper station (No. 237), Anderson's diversion (No. 238) and Crawshaw's ditch (No. 239). These three stations were established on June 25, 1911, by C. G. Cline, and gauge readings were taken during the irrigation seasons of 1911 and 1912. The object of the three stations was to measure the amount of water used by each ditch, and by combining all three to obtain the total flow of the creek coming from Hefferly lake. Moreover, it was difficult to obtain a gauge reader for a station above the Anderson intake.

A vertical staff gauge was placed at each station, and the datum of each was referred to three bench-marks.

The data of discharge here given were obtained, as has been said, by combining the flow of all three stations. The quantity of water running in the Anderson and Crawshaw ditches is also published.

Hefferly Creek, at Mouth (236).

This station was established on August 19, 1911, by C. G. Cline. It is located above Austen's diversions, near the mouth of the creek, about 100 yards upstream from the Hefferly Creek bridge, and 40 feet from the road. The gauge is a vertical staff, 5 feet long, and is nailed to a fallen fir tree on the left bank of the creek. The datum of the gauge is referred to three bench-marks. The banks are from 3 to 5 feet high and do not overflow at high water. Measurements are made with a current meter by the wading method, at a section about 100 feet below the gauge. This station shows the total flow of Hefferly creek, except that which is used by Anderson and Crawshaw, and includes the flow of Edwards creek. Hefferly creek below the Austen headgates is dry during the irrigation season, as nearly all the water is used.

Discharge Measurements of Hefferly Creek, at mouth, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1911.							
Aug. 19..	C. G. Cline	1046	6·5	3·0	0·4	0·81	1·3
Sept. 13	"	1046	7·0	3·6	0·5	0·88	1·9
1912.							
April 3	"	1057	6·0	3·6	0·8	1·0	3·0
May 13	E. M. Dann	1044	12·5	16·1	3·5	2·05	54·8
May 14....	"	1044	15·5	19·3	3·7	2·2	71·7
May 30	"	1044	9·0	8·2	2·9	1·6	23·3
June 10	"	1044	8·0	3·6	1·0	1·0	3·6
Aug. 19 ..	H. J. Keys	1057	8·5	3·4	1·7	1·06	5·8

Daily Gauge Height and Discharge of Hefferly Creek, at mouth, for 1911.

Day.	August.		September.		October.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·82	1·4	0·85	1·6
2			0·82	1·4	0·87	1·8
3			0·82	1·4	0·87	1·8
4			0·82	1·4	0·87	1·8
5			0·82	1·4	0·9	2·0
6			0·82	1·4	0·9	2·0
7			0·85	1·6	0·92	[illegible]
8			0·85	1·6	0·92	[illegible]
9			0·85	1·6	0·87	1·8
10			0·85	1·6	0·87	1·8
11			0·85	1·6	0·87	1·8
12			0·85	1·6	0·87	1·8
13			0·82	1·4	0·87	1·8
14			0·82	1·4	0·9	2·0
15			0·82	1·4	0·9	2·0
16			0·82	1·4	0·9	2·0
17			0·82	1·4	0·9	2·0
18			0·82	1·4	0·9	2·0
19	0·8	1·3	0·82	1·4	0·9	2·0
20	0·85	1·6	0·8	1·3	0·9	2·0
21	0·85	1·6	0·8	1·3	0·9	2·0
22	0·85	1·6	0·8	1·3	0·9	2·0
23	0·85	1·6	0·8	1·3	0·9	2·0
24	0·82	1·4	0·82	1·4	0·9	2·0
25	0·82	1·4	0·82	1·4	0·95	[illegible]
26	0·8	1·3	0·82	1·4	0·95	[illegible]
27	0·8	1·3	0·82	1·4	0·95	[illegible]
28	0·8	1·3	0·85	1·6	0·95	[illegible]
29	0·8	1·3	0·85	1·6	1·1	6·3
30	0·82	1·4	0·85	1·6	1·17	8·0
31	0·82	1·4	....	....	1·17	8·0

Monthly Discharge of Hefferly Creek, at mouth, for 1911.
(Drainage area, 65 square miles.)

Month.	Discharge in Second Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet
August	1·6	1·3	1·4	0·02	0·02	86
September	1·6	1·3	1·4	0·02	0·02	83
October	8·0	1·6	2·6	0·04	0·05	160

Note.—This station was not established till the latter end of August. It would be impossible to estimate the freshet flow for 1911, but it would be considerably smaller than that of 1912, which was an exceptionally wet year.

Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Hefferly Creek, at mouth, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	......	......	1·35	13·5	1·6	23·2	0·95	2·8	1·1	6·3	1·1	6·3
2	......	......	1·85	38·1	1·5	19·0	1·0	3·7	1·1	6·3	1·1	6·3
3	1·0	3·7	1·7	28·5	1·4	15·2	1·1	6·3	1·05	5·0	1·15	7·5
4	1·0	3·7	1·65	25·8	1·3	11·8	1·15	7·5	1·05	5·0	1·15	7·5
5	1·0	3·7	1·7	28·5	1·25	10·3	1·1	15·2	1·05	5·0	1·15	7·5
6	1·0	3·7	1·7	28·5	1·2	8·8	1·3	11·8	1·0	3·7	1·1	6·3
7	1·0	3·7	1·85	38·1	1·2	8·8	1·3	11·8	1·0	3·7	1·2	8·8
8	1·0	3·7	2·05	55	1·2	8·8	1·3	11·8	1·0	3·7	1·2	8·8
9	1·0	3·7	2·2	72	1·1	6·3	1·2	8·8	1·0	3·7	1·2	8·8
10	1·05	5·0	2·2	72	1·1	6·3	1·2	8·8	1·0	3·7	1·2	8·8
11	1·07	5·5	2·1	60	0·95	2·8	1·15	7·5	1·0	3·7	1·15	7·5
12	1·3	11·8	2·1	60	1·0	3·7	1·15	7·5	1·0	3·7	1·15	7·5
13	1·15	7·5	2·1	60	1·1	6·3	1·15	7·5	1·0	3·7	1·1	6·3
14	1·15	7·5	2·2	72	1·1	6·3	1·15	7·5	1·0	3·7	1·1	6·3
15	1·1	6·3	2·5	108	1·3	11·8	1·1	6·3	1·0	3·7	1·1	6·3
16	1·1	6·3	2·5	108	1·3	11·8	1·0	3·7	1·0	3·7		
17	1·1	6·3	2·4	96	1·2	8·8	1·0	3·7	1·0	3·7		
18	1·0	3·7	2·3	84	1·0	3·7	1·0	3·7	1·1	6·3		
19	1·0	3·7	2·2	72	0·9	2·0	1·0	3·7	1·1	6·3		
20	1·0	3·7	2·2	72	0·95	2·8	1·0	3·7	1·1	6·3		
21	1·0	3·7	2·0	50	0·95	2·8	1·0	3·7	1·05	5·0		
22	1·0	3·7	1·9	41·7	1·0	3·7	1·0	3·7	1·05	5·0		
23	1·0	3·7	1·9	41·7	1·1	6·3	1·15	7·5	1·05	5·0		
24	1·0	3·7	1·9	41·7	1·1	6·3	1·15	7·5	1·05	5·0		
25	1·05	5·0	1·95	45·9	1·0	3·7	1·3	11·8	1·05	5·0		
26	1·05	5·0	1·95	45·9	1·15	7·5	1·3	11·8	1·0	3·7		
27	1·05	5·0	1·85	38·1	1·35	13·5	1·25	10·3	1·0	3·7		
28	1·1	6·3	1·8	34·5	1·35	13·5	1·2	8·8	1·0	3·7		
29	1·1	6·3	1·7	28·5	1·1	6·3	1·2	8·8	1·05	5·0		
30	1·25	10·3	1·7	28·5	1·0	3·7	1·35	7·5	1·05	5·0		
31	......	......	1·6	23·2			1·1	6·3	1·05	5·0		

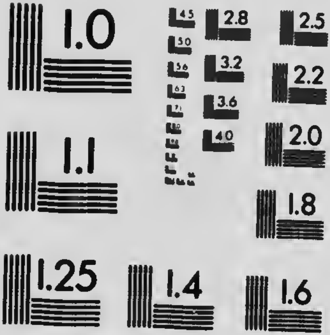
MONTHLY DISCHARGE of Hefferly Creek, at mouth, for 1912.
(Drainage area, 65 square miles.)

Month.	Discharge in Second Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
April	11·8	3·7	5·2	·08	·09	309
May	108	13·5	52	·80	·92	3,200
June	23·2	2·0	8·2	·13	·14	488
July	15·2	2·8	7·5	·12	·14	461
August	6·3	3·7	4·6	·07	·08	282

NOTE.—Accuracy, "A."

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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DISCHARGE MEASUREMENTS of Hefferly Creek, below Hefferly Lake, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft
	In Hefferly Cr. below Anderson and Crawshaw Ditches.						
June 25, 1911	C. G. Cline	1046	5·0	3·6	2·2	1·23	8·0
Aug. 14, 1911	"	1046	3·0	0·6	0·7	0·85	0·4
May 14, 1912	E. M. Dann	1044	11	10·5	2·9	1·68	30·4
May 15, 1912	"	1014	12	18·5	3·7		68·5
May 30, 1912	"	1044	6	4·5	2·8	1·42	12·7
June, 9, 1912	"	1044	4·5	1·5	0·7	1·0	1·1
Aug. 20, 1912	H. J. Keys	1057	2·5	0·7	2·5	0·99	1·8
	In Anderson's Ditch.						
June 26, 1911	C. G. Cline	1046	6·0	4·4	2·2	1·41	9·5
Aug. 14, 1911	"	1046	5·0	1·7	0·65	0·77	1·1
Sept. 18, 1911	"	1046	3·0	1·3	0·73	0·71	1·0
May 14, 1912	E. M. Dann	1044	4·0	3·4	1·8	1·05	6·2
Aug. 20, 1912	H. J. Keys	1057	7·0	3·6	1·4	1·12	5·2
	In Crawshaw's Ditch.						
June 26, 1911	C. G. Cline		2·0	0·5	2·0	0·2	1·0
Aug. 14, 1911	"		2·0	0·3	1·2	0·1	0·4

NOTE.—There are three gauges, one in the creek, and one in each ditch. The combined discharges give the flow of Hefferly creek below Hefferly lake.

MONTHLY DISCHARGE of Hefferly Creek, below Hefferly Lake, for 1911.

(Drainage area, 30 square miles.)

Month.	Discharge in Second-Feet.		Run-off		Rain fall.
	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
July	12·3	·41	·47	756	
August	2·8	·09	·10	172	
September	1·3	·04	·04	77	
October	1·2	·04	·05	74	
November	1·3	·04	·04	77	
December	0·4	·01	·01	25	
The period					[illegible]

NOTE.—Stations were not established till after the spring freshet. Run-off is slightly under the influence of artificial control on Hefferly lake.

Accuracy "B."

MONTHLY DISCHARGE of Hefferly Creek, below Hefferly Lake, for 1912.
(Drainage area, 30 square miles.)

Month.	Discharge in Second-Feet.		Run-off.		Rain-fall.
	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	34·5	1·15	1·33	2,121	
June	13·3	·44	·49	791	
July	4·7	·16	·18	289	
August	6·5	·22	·25	400	
The period	....	....	.....	....	14

NOTE.—See note on 1911 sheet.
Accuracy "B."

Daily Gauge Height and Discharge of

Day.	June.		July.		August.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	1·35	8·0	0·9	2·0
2	....	....	1·35	8·0	0·85	1·6
3	....	....	1·38	7·4	0·85	1·6
4	....	....	1·3	7·2	0·85	1·6
5	....	....	1·35	8·0	0·85	1·6
6	....	....	1·3	7·2	....	1·6
7	....	....	1·3	7·2	0·85	1·6
8	....	....	1·3	7·2	0·85	1·6
9	....	....	1·25	6·5	0·8	1·2
10	....	....	1·25	6·5	0·8	1·2
11	....	....	1·22	6·0	0·8	1·2
12	....	....	1·2	5·7	0·8	1·2
13	....	....	1·2	5·7	0·75	1·0
14	....	....	1·17	5·2	0·75	1·0
15	....	....	1·15	5·0	0·7	0·9
16	....	....	1·07	3·9	0·7	0·9
17	....	....	1·02	3·3	0·7	0·9
18	....	....	1·0	3·0	0·65	0·6
19	....	....	1·0	3·0	0·65	0·6
20	....	....	1·0	3·0	0	0
21	....	....	1·0	3·0	0	0
22	....	....	1·0	3·0	....	....
23	....	....	1·0	3·0	....	....
24	....	....	1·0	3·0	....	....
25	....	....	0·95	2·5	....	....
26	1·4	8·7	0·95	2·5	....	....
27	1·3	7·2	0·95	2·5	....	....
28	1·3	7·2	0·9	2·0	....	....
29	1·3	7·2	0·9	2·0	....	....
30	1·35	8·0	0·9	2·0	....	....
31	....	....	0·9	2·0	....	....

Anderson Diversion, from Hat Creek, for 1911.

September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
0	0	0·7	0·9	0·7	0·0	0·75	1·0	1
0	0	0·7	0·9	0·7	0·9	0·75	1·0	2
0	0	....	0·9	0·7	0·9	0·75	1·0	3
0	0	0·7	0·9	0·7	0·9	0·75	1·0	4
0	0	0·7	0·9	0·75	1·0	0·75	1·0	5
0	0	0·7	0·9	0·8	1·2	0·75	1·0	6
0	0	0·7	0·9	0·8	1·2	0·75	1·0	7
0	0	0·7	0·9	0·8	1·2	0·75	1·0	8
0·7	0·9	0·7	0·9	0·8	1·2	0·7	0·9	9
0·7	0·9	0·7	0·9	0·75	1·0	....	....	10
0·7	0·9	0·7	0·9	0·7	0·9	....	....	11
0·7	0·9	0·7	0·9	0·7	0·9	....	....	12
0·7	0·9	0·7	0·9	0	0	....	....	13
....	0·9	0·7	0·9	0	0	....	....	14
....	1·0	0·7	0·9	0	0	....	....	15
0·75	1·0	0·7	0·9	0	0	....	....	16
0·75	1·0	0·7	0·9	....	....	....	....	17
0·7	0·9	0·7	0·9	....	....	....	....	18
0·7	0·9	0·7	0·9	0·75	1·0	....	....	19
0·7	0·9	0·7	0·9	0·75	1·0	....	....	20
0·7	0·9	0·7	0·9	0·75	1·0	....	....	21
0·7	0·9	0·7	0·9	0·75	1·0	....	....	22
0·7	0·9	0·7	0·9	0·75	1·0	....	....	23
0·7	0·9	0·7	0·9	0·75	1·0	....	....	24
0·7	0·9	....	0·9	0·75	1·0	....	....	25
0·7	0·9	0·7	0·9	0·75	1·0	....	....	26
0·7	0·9	0·7	9·9	0·75	1·0	....	....	27
0·7	0·9	0·7	0·9	0·7	0·9	....	....	28
0·7	0·9	0·7	0·9	0·7	0·9	....	....	29
0·7	0·9	0·7	0·9	0·7	0·9	....	....	30
....	....	0·7	0·9	....	....	....	....	31

DAILY GAUGE HEIGHT AND DISCHARGE of Anderson Diversion from Hat Creek, for 1912.

Day	April.		May.		June.		July.		August.		September.	
	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.	Gauge height.	Dis-charge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1					1·2	5·7	1·0	3·0	0·85	1·6	0·9	2·0
2			0·65	0·8	1·15	5·0	1·2	5·7	0·85	1·6	0·9	2·0
3			0·55	0·6	1·2	5·7	1·4	8·7	0·85	1·6	0·9	2·0
4			0·5	0·5	1·2	5·7	1·4	8·7	0·85	1·6	0·9	2·0
5			0·5	0·5	1·2	5·7	1·3	7·2	1·0	3·0	0·85	1·6
6			0·55	0·6	1·2	5·7	1·1	4·3	1·1	4·3	0·85	1·6
7			0·6	0·7	1·2	5·7	1·0	3·0	1·1	4·3	0·85	1·6
8			0·7	0·9	1·1	4·3	0·95	2·5	1·1	4·3	0·8	1·2
9			0·7	0·9	1·22	6·0	1·0	3·0	1·15	5·0	0·8	1·2
10			0·9	2·0	1·17	5·3	0·95	2·5	1·2	5·7	0·8	1·2
11			0·9	2·0	1·1	4·3	0·95	2·5	1·2	5·7	0·75	1·0
12	0·3	0·1	0·9	2·0	1·1	4·3	0·9	2·0	1·2	5·7	0·75	1·0
13	0·3	0·1	1·0	3·0	1·1	4·3	0·9	2·0	1·2	5·7	0·75	1·0
14	0·3	0·1	1·05	3·6	1·35	8·0	0·9	2·0	1·2	5·7	0·75	1·0
15	0·3	0·1	0·0	0·0	1·35	8·0	0·9	2·0	1·15	5·0	0·75	1·0
16	0·3	0·1	1·1	4·3	1·3	7·2	0·85	1·6	1·2	5·7	0·75	1·0
17	0·3	0·1	0·9	2·0	1·3	7·2	0·85	1·6	1·2	5·7	0·75	1·0
18	0·3	0·1	1·2	5·7	1·25	6·5	0·85	1·6	1·2	5·7	0·75	1·0
19			1·2	5·7	1·25	6·5	0·85	1·6	1·15	5·0	0·7	0·9
20			1·15	5·0	1·25	6·5	0·85	1·6	1·15	5·0	0·7	0·9
21			1·1	4·3	1·3	7·2	0·9	2·0	1·15	5·0	0·7	0·9
22			1·1	4·3	1·3	7·2	0·95	2·5	1·15	5·0		
23			1·2	5·7	1·3	7·2	0·9	2·0	1·15	5·0		
24			1·25	6·5	1·3	7·2	0·9	2·0	1·15	5·0		
25			0·9	2·0	1·3	7·2	0·9	2·0	1·1	4·3		
26			1·2	5·7	1·3	7·2	0·9	2·0	1·1	4·3		
27			1·2	5·7	1·3	7·2	0·9	2·0	1·1	4·3		
28			1·2	5·7	1·3	7·2	0·9	2·0	1·1	4·3		
29			1·2	5·7	1·1	4·3	0·9	2·0	0·85	1·6		
30			1·1	4·3	1·05	3·6	0·9	2·0	0·7	0·9		
31			1·2	5·7			0·9	2·0	0·9	2·0		

DAILY GAUGE HEIGHT AND DISCHARGE of Crawshaw's Ditch, Hat Creek, for 1911.

Day.	June.		July.		August.		September.	
	Guage height.	Discharge.	Guage height.	Discharge.	Guage height.	Discharge.	Guage height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·4	2·6	0·25	1·4	0·1	0·4
2			0·4	2·6	0·25	1·4		0·5
3			0·4	2·6	0·25	1·4		0·6
4			0·4	2·6	0·25	1·4	0·15	0·7
5			0·4	2·6		1·4	0·15	0·7
6			0·42	2·8		1·4	0·1	0·4
7			0·32	2·0		1·4	0·1	0·4
8			0·2	1·0		1·4	0·1	0·4
9				1·0		1·4		
10			0·2	1·0	0·25	1·4		
11			0·2	1·0		1·1		
12			0·2	1·0		0·8		
13			0·2	1·0		0·6		
14			0·2	1·0	0·1	0·4		
15				0·9		0·0		
16			0·15	0·7		0·0		
17			0·15	0·7				
18			0·27	1·6				
19				2·1	0·1	0·4		
20			0·4	2·6	0·1	0·4		
21				2·3		0·9		
22				2·0	0·25	1·4		
23			0·3	1·8	0·25	1·4		
24			0·3	1·8	0·25	1·4		
25				1·8	0·25	1·4		
26	0·2	1·0		1·8	0·22	1·2		
27	0·22	1·2	0·3	1·8	0·15	0·7		
28	0·3	1·8	0·3	1·8	0·15	0·7		
29	0·4	2·6	0·25	1·4	0·15	0·7		
30	0·4	2·6		1·4	0·12	0·5		
31			0·25	1·4	0·1	0·4		

Daily Gauge Height and Discharge of Crawshaw's Ditch, Hat Creek, for 1912.

Day.	May. Gauge height	May. Discharge	June. Gauge height	June. Discharge	July. Gauge height	July. Discharge	August. Gauge height	August. Discharge	September. Gauge height.	September. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	...			2·0	0·15	0·7	...	...	...	1·6
2			0·3	1·8	0·2	1·0	...	...	0·4	2·6
3			0·2	1·0	0·25	1·4	...	...	0·1	0·4
4			0·5	3·5	0·3	1·8	...	...	0·1	0·4
5	...		0·4	2·6	0·25	1·4	...	...	0·1	0·4
6			0·45	3·0	0·25	1·4	0·2	1·0	0·1	0·4
7			0·45	3·0	0·1	0·4	...	1·0	0·1	0·4
8			0·35	2·2	0·02	0·1	0·2	1·0	0·1	0·4
9			0·4	2·6	0·0	0·0	...	1·2	0·1	0·4
10			0·37	2·4		...	0·25	1·4	0·05	0·2
11			0·3	1·8			0·25	1·4	0·0	...
12			0·3	1·8			0·25	1·4	...	...
13			0·25	1·4			0·25	1·4	...	...
14			0·0	0·0			0·25	1·4	...	...
15			0·0	0·0			0·25	1·4	...	...
16	0·35	2·2	0·4	2·6			0·25	1·4	...	...
17	0·35	2·2	0·4	2·6		...	0·25	1·4	...	...
18	0·3	1·8	0·4	2·6			0·25	1·4	...	...
19		1·6	0·35	2·2			0·25	1·4	...	...
20	0·25	1·4	0·35	2·2				1·2	...	...
21	0·35	2·2	0·4	2·6			0·2	1·0	...	...
22	0·35	2·2	0·4	2·6			0·2	1·0	...	...
23	0·35	2·2	0·4	2·6		...	0·2	1·0	...	...
24		2·8	0·4	2·6			0·2	1·0	...	...
25	0·5	3·5	0·45	3·0		...		0·9	...	...
26	0·5	3·5	0·4	2·6			0·15	0·7	...	...
27	0·3	1·8	0·4	2·6			0·15	0·7	...	...
28	0·45	3·0	0·4	2·6			0·15	0·7	...	...
29	0·4	2·6	0·25	1·4			0·4	2·6	...	...
30		2·4	0·2	1·0			0·15	0·7	...	...
31	0·35	2·2					0·15	0·7	...	...

Horsethief Creek.

Horsethief creek is a stream about 25 miles long, which rises in the Selkirk mountains at an elevation of from 6,000 feet to 9,000 feet. It flows in an easterly direction, and discharges into Upper Columbia river at an elevation of 2,700 feet, 4 miles below lake Windermere. Near the mouth, Horsethief creek is from 50 feet to 200 feet wide, and from 2 feet to 6 feet deep, with a mean velocity of from 1 foot to 5 feet per second. The tributaries in ascending order from the mouth are: Eight-mile creek, Boulder creek, Law creek, Taylor creek and Gopher creek, all discharging from the left. The drainage area of Horsethief creek, as measured from a provincial map (1911) with a scale of 8 miles to an inch, is 170 square miles. The precipitation varies from about 14 inches at the mouth to over 50 inches at the source. The winters are long and particularly cold near the source. The summers are hot and, near the mouth, dry.

The Columbia River Irrigated Fruitlands Co. hold large irrigated records on Horsethief creek. Logging is being extensively carried on by the Columbia River Lumber Co. The logs are driven down Horsethief creek into the Columbia, and down the Columbia for 100 miles to the mill at Golden.

There are power possibilities on Horsethief creek. Immediately above the measuring section (1 mile from the mouth) there is a canyon 6 miles long. In 2½ miles the water in the canyon falls 180 feet, and in 6 miles there is a fall of 765 feet (measured by aneroid). At the head of the canyon a series of falls gives a head of 32 feet. Above the falls, Horsethief creek flows through a flat country, sparsely timbered. Any installation would be expensive, as the flow of Horsethief creek, except in June, July and August, does not average over 100 c.f.s. The winters are severe, and frazil ice has to be contended with.

During the freshet in June, July and August, Horsethief creek discharges large deposits of silt into the Upper Columbia. Shifting bars are continually formed at the two mouths of the stream, causing possibly the largest inconvenience to navigation on the Upper Columbia. The big freshet is also of interest on account of the proposal to reclaim some 50,000 acres of overflow land in the Upper Columbia valley.

Horsethief Creek.

The station on Horsethief creek was established May 29, 1912, by H. C. Hughes. Measurements were made from the down-stream side of the highway bridge, Wilmer to Forsters, about one mile from the mouth of the stream. A standard vertical staff gauge, 7 feet long is nailed to the cribbing on the left bank of the stream beneath the above-mentioned bridge. Measurements are made with the meter, using from 6½ to 15 pounds of lead, suspended by a cable. The initial point for sounding is at the right abutment on the lower side of the bridge. The channel above and below the station is straight for about 100 feet and the water is very swift. All the water flows through the bridge abutments except at high water, when there is a small side channel flowing to the left of the bridge. The river at the section is shallow and the bed is very rough, causing an uneven velocity. Due to this factor, the accuracy is decreased.

Discharge Measurements of Horsethief Creek, near mouth, 1912.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 29	H. C. Hughes	1055	90	130	3·8	1·70	484
June 13	"	1055	95	220	5·3	2·00	1,180
July 3	"	1055	107	225	5·2	1·90	1,170
Sept. 28	C. E. Richardson	1055	61	120	2·1	1·22	250

DAILY GAUGE HEIGHT AND DISCHARGE of Horsethief Creek, at mouth, for 1912.

Day.	May.		June.		July.		August.		September.		October.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·7	700	2·1	1,400	2·3	1,850	1·6	575	1·3	300
2			1·6	575	2·3	1,850	2·2	1,620	1·6	575	1·3	300
3			1·7	700	2·1	1,400	2·2	1,620	1·6	575	1·4	375
4			1·5	465	2·1	1,400	2·1	1,400	1·6	575	1·4	375
5			1·6	575	2·0	1,200	2·2	1,620	1·6	575	1·3	300
6			1·6	575	1·9	1,000	2·0	1,200	1·6	575	1·2	240
7			1·8	850	1·9	1,000	2·1	1,400	1·5	465	1·2	240
8			1·9	1,000	2·0	1,200	2·0	1,200	1·6	575	1·3	300
9			1·9	1,000	2·0	1,200	2·0	1,200	1·6	575	1·2	240
10			1·8	850	2·1	1,400	1·9	1,000	1·5	465	1·3	300
11			1·8	850	2·0	1,200	1·9	1,000	1·6	575	1·2	240
12			2·0	1,200	1·9	1,000	1·8	850	1·5	465	1·1	190
13			2·0	1,200	1·9	1,000	1·8	850	1·6	575	1·2	240
14			1·9	1,000	2·0	1,200	1·8	850	1·5	465	1·1	190
15			1·8	850	1·9	1,000	1·8	850	1·6	575	1·0	150
16			1·7	700	1·9	1,000	1·7	700	1·6	575	1·0	150
17			1·8	850	2·0	1,200	1·7	700	1·7	700	1·0	150
18			1·9	1,000	2·1	1,400	1·7	700	1·6	575	1·0	150
19			1·9	1,000	1·9	1,000	1·9	1,000	1·6	575	1·0	150
20			2·0	1,200	2·0	1,200	1·9	1,000	1·6	575	0·9	120
21			2·2	1,620	1·9	1,000	2·6	2,620	1·6	575	0·9	120
22			2·4	2,100	2·1	1,400	2·7	2,880	1·5	465	0·8	95
23			2·7	2,880	2·0	1,200	3·1	3,950	1·5	465	0·8	95
24			3·0	3,680	2·0	1,200	3·0	3,680	1·4	375	0·8	95
25			2·9	3,420	2·0	1,200	2·9	3,420	1·5	465	0·7	75
26			3·0	3,680	2·0	1,200	2·6	2,620	1·4	375	0·7	75
27			2·8	3,150	1·9	1,000	2·3	1,850	1·5	465	0·7	75
28			2·9	3,420	2·1	1,400	2·0	1,200	1·4	375	0·6	65
29	1·7	700	2·4	2,100	2·0	1,200	1·9	1,000	1·4	375	0·6	65
30	1·8	850	2·2	1,620	2·1	1,400	1·8	850	1·3	300	0·6	65
31	1·6	575	.....		2·3	1,850	1·7	700	.....	.....	0·6	65
											Freeze-up.	

MONTHLY DISCHARGE of Horsethief Creek, at mouth, for June to October, 1912.
(Drainage area, 170 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	3,680	465	1,490	8·8	9·8	89·000
July	1,850	1,000	1,240	7·3	8·4	6,000
August	3.950	700	1,530	9·0	10·4	94,000
September	700	300	510	3·0	3·3	30,600
October	375	65	180	1·1	1·3	11,100

NOTE.—Freeze-up occurred October 30, 1912.
Accuracy "C."

Illecillewaet River (406).

Illecillewaet river has its source in the Illecillewaet névé, at an elevation of 8,000 feet, and flowing in a southwesterly direction, discharges into Columbia river near Revelstoke, at an elevation of 1,800 feet. It is part of the Columbia drainage; the drainage area, as measured from a Dominion sectional map, scale 3 miles to an inch, is 480 square miles, of which area 140 square miles is above Albert canyon. The precipitation varies from 40 inches, at the mouth, to 100 inches at the source; the winters are very severe (−50 F.) with a tremendous snowfall (30 feet). The summers are hot and wet.

It is a typical mountain stream, and flows through a series of canyons and flats. The summer flow of the stream is very large, and rises and falls during the day to the extent of 1·5 ft. The maximum flow near the mouth occurred, in 1912, on June 23, and 9,080 c.f.s. was the mean flow for that day. The mean flow for June, July and August was 4,350 c.f.s. The flow during January, February and March was very small, and averaged not over 250 c.f.s. The control above the gauging station, from which these discharges were obtained, is artificial, being influenced by the Revelstoke Power Co.'s dam.

Power developments have been installed on this river at Revelstoke and at Glacier. At Revelstoke, a head of 73 feet is obtained by a concrete dam, 50 feet high and 45 feet wide, and a flume 200 yards long. A development of 750 horse-power is used to light the city of Revelstoke. At Glacier, the C.P.R. installed a small plant to light the 'Glacier House' (tourists' hotel): a head of 60 feet is used, and about 100 horse-power is developed. There are other possible developments on this stream, in Albert Canyon gorge and in the Box canyon, 3 miles above Revelstoke. In all developments on this stream, frazil ice must be contended with; also, slides during the winter hold back the water as long as forty-eight hours, and then the rush of water carries with it gravel, logs, etc. There are no natural reservoirs on the stream, and the C.P.R. running along its bank prohibits any large artificial storage.

There are at present no other interests on this stream. Valuable timber may be found anywhere in the Illecillewaet drainage, especially along the North Fork. A large mining syndicate operated on the North Fork several years ago, but is not now in existence. The scenic beauty of the Illecillewaet valley is known to the thousands of tourists who yearly pass over the main line of the C.P.R.

The river station was established October 13, 1911, by C. E. Richardson. The measuring section is located on the lower traffic bridge, [illegible] mile [illegible] a half from Revelstoke, and three-quarters of a mile from the mouth of the ri[illegible]able measurements are made from the downstream side of the bridge. A chain gauge, 26·8 feet long, is used, and the graduations are painted on the handrail on the upstream side of the traffic bridge near Moran's house. The measuring section is excellent; the control is good, the current uniform, the channel straight, with a perm[illegible]ed, and the banks are not liable to overflow except at very high water, whe[illegible]er might flow through a side channel, 100 yards to the left of the bridge.

Revelstoke Light and Power Company's Dam on Illecillewaet River.

Revelstoke Light and Power Company's Pipe Line.

DISCHARGE MEASUREMENTS of Illecillewaet River, near Revelstoke, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Oct. 13	C. E. Richardson	1048	140	480	1·4	1·52*	370
1912.							
Feb. 24	"	1047	130	220	0·9	0·7	197
June 20	"	1018	144	890	7·4	6·6	6,610
June 24	"	1048	145	960	7·8	6·9	7,510
July 3	"	1048	142	735	5·6	5·6	4,100
Aug. 20	"	1048	133	580	4·0	4·3	2,320
Sept. 14	"	1048	128	514	3·4	3·82	1,750
Oct. 4	"	1055	128	498	2·2	3·0	1,080
Nov. 2	"	1044	128	460	1·5	2·9	690

*Gauge and all bench-marks were destroyed on January 2, 1912.

DAILY GAUGE HEIGHT AND DISCHARGE of Illecillewaet River, near Revelstoke, for 1911.

DAY.	OCTOBER.		NOVEMBER.		DECEMBER.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·86	391	1·86	391
2			1·89	401	1·65	332
3			1·91	408	1·65	332
4			1·70	344	1·66	354
5			1·90	404	1·76	361
6			1·90	404	1·70	344
7			1·90	404	1·70	344
8			2·0	440	1·71	347
9			1·91	408	1·74	355
10			1·62	325	1·75	358
11			1·62	325	1·60	320
12			1·59	318	1·65	332
13	2·52	671	1·89	401	1·69	342
14	2·86	890	1·90	404	1·65	332
15	2·55	688	1·95	422	1·62	325
16	2·50	660	2·39	605	1·62	325
17	2·4	610	2·4	610	1·70	344
18	2·3	563	2·44	630	1·70	344
19	2·25	541	2·41	615	1·72	350
20	1·82	378	1·95	422	1·78	366
21	2·4	610	1·94	418	1·64	330
22	2·18	510	1·91	408	1·61	322
23	2·1	478	1·89	401	1·60	320
24	2·1	478	1·71	347	1·60	320
25	2·1	478	1·75	358	1·59	318
26	2·0	440	1·72	350		
27	2·02	448	1·94	418		
28	2·01	444	2·15	498		
29	1·91	408	2·12	486		
30	1·98	433	2·06	469		
31	1·94	418				

MONTHLY DISCHARGE of Illecillewaet River, near Revelstoke, for 1911.

(Drainage area, 480 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
October	890	378	637	1·3	1·5	39,200	
November	630	318	428	0·9	1·0	25,500	
December	391	300	332	0·7	0·8	20,400	
The period							40 to 70

NOTE.—On January 1, 1912, gauge and all bench-marks were destroyed by bridge gang. On the 1912 discharge table, 669 c.f.s. is equivalent to 2·52 on the new gauge. The two gauges are in practically the same section and although the section has been changed slightly by the new bridge piers the control is unaltered By adding 1·2 to 1911 gauge heights and using the 1912 discharge table the 1911 discharges have been correctly deduced.

Accuracy, "B" and "C."

DAILY GAUGE HEIGHT AND DISCHARG

Day.	April.		May.		June.		July.		August.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	3·65	1,040	....	....	5·3	3,610	5·6	4,120
2	....	....	3·05	1,040	....	....	5·2	3,450	5·75	4,400
3	....	....	3·1	1,080	....	....	5·4	3,770	5·3	3,610
4	....	....	3·25	1,210	....	....	5·3	3,610	6·3	5,610
5	....	....	3·4	1,340	....	....	5·75	4,400	6·1	5,120
6	....	....	3·45	1,380	....	....	5·7	4,300	5·0	3,160
7	....	....	3·6	1,530	....	....	5·35	3,690	5·1	3,300
8	....	....	4·4	2,400	....	....	5·35	3,690	5·0	3,160
9	....	....	4·45	2,460	....	....	5·35	3,690	5·8	4,490
10	....	....	4·75	2,830	....	....	5·3	3,610	5·2	3,450
11	....	....	4·55	2,580	....	....	5·35	3,690	5·4	3,770
12	....	....	4·7	2,760	....	....	5·35	3,690	4·95	3,090
13	....	....	4·95	3,090	....	....	6·35	5,750	4·75	2,830
14	....	....	5·45	3,860	....	....	5·25	3,530	4·9	3,020
15	....	....	6·05	5,010	....	....	5·6	4,120	5·15	3,380
16	....	....	6·2	5,350	....	....	5·3	3,610	4·7	2,760
17	....	....	5·7	4,300	....	....	5·4	3,770	5·1	3,300
18	....	....	5·0	3,160	....	....	5·1	3,300	4·15	2,120
19	2·4	610	4·95	3,090	3·65	6,660	5·8	4,490	4·3	2,280
20	2·45	635	5·4	3,770	6·95	7,770	5·75	4,390	4·7	2,760
21	2·7	778	5·45	3,860	7·25	9,060	5·4	3,770	5·35	3,690
22	2·75	812	5·55	4,030	7·05	8,180	5·3	3,610	5·6	4,120
23	3·15	1,120	5·55	4,030	7·25	9,060	5·15	3,380	5·5	3,940
24	3·15	1,120	5·55	4,030	6·9	7,570	5·0	3,160	6·65	6,660
25	3·05	1,040	5·6	4,120	6·85	7,380	5·55	4,030	5·9	4,690
26	2·9	920	5·95	4,800	7·0	7,970	5·3	3,610	5·1	3,300
27	2·95	960	5·95	4,800	7·0	7,970	5·0	3,160	5·4	3,770
28	2·90	920	5·4	3,770	6·05	5,010	5·2	3,450	4·45	2,460
29	3·0	1,000	5·0	3,160	5·35	3,690	5·5	3,940	4·25	2,230
30	3·05	1,040	6·9	7,570	5·1	3,300	5·65	4,210	4·05	2,010
31	....	....	....	6,000	....	....	5·3	3,610	3·8	1,730

of Illecillewaet River, near Revelstoke, for 1912.

September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
3·85	1,780	3·0	1,000	2·5	660	2·30	563	1
3·75	1,680	2·95	960	2·55	688	2·30	563	2
3·9	1,840	3·3	1,250	2·55	688	2·25	541	3
3·7	1,630	3·25	1,210	2·5	660	2·40	610	4
3·7	1,630	3·0	1,000	2·55	688	2·30	563	5
3·55	1,480	2·95	960	2·55	688	2·30	563	6
3·7	1,630	2·80	850	2·55	688	2·30	563	7
3·85	1,780	2·85	880	2·55	688	2·30	563	8
3·85	1,780	2·8	850	2·5	660	2·30	563	9
3·85	1,780	2·85	880	2·4	610	2·30	563	10
4·05	2,010	2·75	810	2·4	610	2·25	541	11
4·25	2,230	2·7	780	2·4	610	2·25	541	12
4·05	2,010	2·7	780	2·45	635	2·30	563	13
3·75	1,680	2·65	750	2·5	660	2·30	563	14
3·55	1,480	2·7	780	2·5	660	2·30	563	15
3·5	1,430	2·85	880	2·4	610	2·20	519	16
3·4	1,340	3·7	1,630	2·4	610	2·20	519	17
3·5	1,430	3·35	1,300	2·4	610	2·20	519	18
3·3	1,250	3·1	1,080	2·45	635	2·15	498	19
3·2	1,170	3·05	1,040	2·6	716	2·15	498	20
3·2	1,170	3·35	1,300	2·75	813	2·10	478	21
3·2	1,170	3·5	1,430	2·6	716	2·10	478	22
3·2	1,170	2·90	920	2·55	688	2·05	459	23
3·2	1,170	2·75	810	2·65	747	2·05	459	24
3·0	1,000	2·8	850	2·45	635	2·10	478	25
2·95	969	2·8	850	2·40	610	2·10	478	26
2·85	880	2·8	850	2·40	610	2·15	498	27
2·8	850	2·6	720	2·40	610	2·20	519	28
2·8	850	2·5	660	2·40	610	2·15	498	29
2·75	810	2·6	720	2·40	610	2·05	459	30
......	......	2·5	660	......	......	2·05	459	31

MONTHLY DISCHARGE of Illecillewaet River, near Revelstoke, for 1912.
(Drainage area, 480 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	7,570	1,040	3,340	7·0	8·1	205,000	
June	9,060	3,300	5,790	12·1	13·5	344,000	
July	5,750	3,160	3,810	8·0	9·2	234,000	
August	6,660	1,730	3,490	7·3	8·4	215,000	
September	2,230	810	1,440	3·0	3·3	85,700	
October	1,630	660	950	2·0	2·3	58,400	
November	812	610	657	1·4	1·6	39,100	
December	610	459	524	1·1	1·3	32,200	
The period							80

NOTE.—Winter conditions existed during January and February. The discharge is partially controlled by the dam of the city of Revelstoke Power Company.
Accuracy, "A," "B" and "C."

INGRAM CREEK (300).

Ingram creek rises in the Bouleau hills just south of Grand Prairie, at an elevation of about 4,000 feet, and flows into Salmon river in township 17, range 13, west of the 6th meridian, 3 miles east of Grand Prairie village, at an elevation of about 1,880 feet. The creek is about 9 miles long, and drains an area of 25 square miles. The drainage area is a broken plateau extending southerly from the bowl-shaped Grand Prairie to the Bouleau hills, which separate Ingram creek and Salmon river from the Okanagan divide. About seven miles from the mouth of Ingram creek there is a meadow, called Homfray's meadow, which could be used as a reservoir in which to store the surplus waters of the May floods. At Homfray's meadow the creek has an abrupt turn from the east, and about a mile from this turn the creek divides into two forks. On the north fork there are two meadows, which might be suitable for storage reservoirs. These are Wolf's and Johnston's meadows. On account of improvements on Wolf's meadow, or homestead, Johnston's meadow might be the only site available for storage, unless the economic value of the stored water in Homfray's and Wolf's meadows for use in the valuable Grand Prairie lands be considered greater than the said meadows for actual cultivation.

The mean annual precipitation in Grand Prairie and the Ingram drainage is about 12 inches. Irrigation is necessary, and the waters of Ingram creek are extremely valuable for irrigation purposes. Some of the water is now used on the Ingram estate and neighbouring lands at the mouth of the stream, but by far the greater proportion of the flood waters of May and June run to waste into Salmon river.

There are some six old provincial water records from Ingram creek, the first one (dated 1871) being appurtenant to the Ingram estate, and practically controls the natural flow of the stream during the latter part of the irrigation season.

The run-off of Ingram creek has been studied during the open season of 1911 and 1912. A station was established a short distance above the mouth and all irrigation diversions. Meter measurements were taken, and daily records of gauge height. The resulting hydrographic data for the periods, April 1 to September 30, 1911, an

April 1 to September 1, 1912, are appended. The year 1911 was a dry year throughout nearly the whole Dry Belt. The maximum discharge of Ingram creek took place on May 17, 1911, and was 52 cubic feet per second (gauge height, 1·64 feet). The minimum flow occurred September 19, and was 0·5 c.f.s. with a gauge height of 0·3 feet. The total run-off from April 1 to September 30 was a little over 3,000 acre-feet. The flow prior to April 1, and later than September 30 was very small, being less than 1 c.f.s.

The year 1912 had a much larger run-off. The maximum discharge took place again on May 17, and was 130 c.f.s., with a gauge height of 2·15 feet. The minimum recorded stage was on August 9, being 3·0 c.f.s., and the gauge height of 0·65 feet. The total run-off from April 1 to September 1, 1912, was 7,000 acre-feet.

A river station was established n Ingram creek, May 24, 1911, by C. E. Richardson. The measuring section is located half a mile from the Armstrong-Grand Prairie road, 3 miles from the latter town, and 25 feet above King's diversion. This is an excellent section—the water is swift, the control good, the banks not liable to overflow, and there is only one channel, with a permanent rocky bed. The measurements are made by wading. A standard staff gauge was located on the right bank 200 yards above the King or Ingram diversion. On May 16, 1912, this gauge was washed out by the floods, and a similar gauge was located on the left bank, directly opposite the position of the former gauge. Both gauges were referred to the same three benchmarks.

DISCHARGE MEASUREMENTS of Ingram Creek, near Grand Prairie, 1911-12.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911.			Feet.	Sq. ft.	Ft.per sec.	Feet.	Sec.-ft.
May 24......	C. E. Richardson.........	1048	18·0	20·3	1·9	1·51	38·2
May 24......	C. G. Cline..............	1046	18·0	19·6	1·8	1·51	36·5
June 16......	W. M. Carlyle............	1044	15·0	8·2	1·0	1·01	7·9
July 12......	"	1044	14·0	9·2	0·6	0·90	5·9
July 26......	"	1044	7·0	2·9	0·9	0·62	2·7
Aug. 23......	"	1044	5·0	2·0	0·7	0·46	1·5
1912.							
May 11......	C. E. Richardson...........	1048	18·0	18·5	3·1	1·68	57·0
July 16......	"	1048	5·0	4·7	1·3	0·82	6·0

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	April.		May.		June.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		1·0		15	1·3	17
2		1·0		18	1·3	17
3		1·0		20	1·4	25
4		2·0		22	1·3	17
5		2·0		24	1·2	12·7
6		2·0		25	1·2	12·7
7		2·0		24	1·2	12·7
8		3·0		24	1·2	12·7
9		3·0		23	1·1	10
10		3·0		23	1·3	17
11		3·0		23	1·1	10
12		3·0		23	1·1	10
13		4·0		23	1·05	8·8
14		4·0		24	1·0	7·6
15		4·0		24	1·0	7·6
16		5·0		38	0·98	7·3
17		5·0		52	0·98	7·3
18		5·0		49	0·95	6·7
19		6·0		45	0·95	6·7
20		6·0		42	0·9	5·8
21		7·0		38	0·98	7·3
22		8·0		38	1·05	8·8
23		9·0		37	1·0	7·6
24		10	1·51	37	1·0	10
25		10	1·4	25	1·1	8·8
26		10	1·4	25	1·05	8·8
27		11	1·4	25	1·05	8·8
28		12	1·4	25	1·0	7·6
29		12	1·3	17	0·98	7·3
30		13	1·3	17	0·98	6·7
31			1·3	17		

SESSIONAL PAPER No. 25f

Ingram Creek, near Grand Prairie, for 1911.

July.		August.		September.		October.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
0·95	6·7	0·5	1·7	0·4	1·1	0·4	1·0	1
0·9	5·8	0·48	1·6	0·42	1·2	0·35	0·8	2
0·88	5·6	0·48	1·6	0·41	1·1	0·35	0·8	3
0·85	5·1	0·4	1·1	0·41	1·1	0·4	1·0	4
0·8	4·4	0·55	2·1	0·41	1·1			5
0·8	4·4	0·58	2·3	0·41	1·1			6
1·1	10·0	0·65	2·9	0·41	1·1			7
1·2	12·7	0·65	2·9	0·41	1·1			8
1·2	12·7	0·65	2·9	0·4	1·1			9
1·15	11·3	0·6	2·4	0·4	1·1			10
1·1	10·0	0·58	2·3	0·4	1·1			11
1·0	7·6	0·55	2·1	0·45	1·4			12
0·9	5·8	0·55	2·1	0·5	1·7			13
0·88	5·6	0·55	2·1	0·45	1·4			14
0·85	5·1	0·5	2·1	0·45	1·4			15
0·7	3·3	0·5	1·7	0·45	1·4			16
0·78	4·2	0·55	2·1	0·4	1·1			17
0·75	3·9	0·5	1·7	0·35	0·8			18
0·75	3·9	0·45	1·4	0·3	0·5			19
0·68	3·1	0·45	1·4	0·35	0·8			20
0·65	2·9	0·45	1·4	0·4	1·1			21
0·65	2·9	0·48	1·6	0·4	1·1			22
0·65	2·9	0·45	1·4	0·35	0·8			23
0·60	2·4	0·45	1·4	0·35	0·8			24
0·60	2·4	0·45	1·4	0·3	0·5			25
0·58	2·3	0·42	1·2	0·35	0·8			26
0·55	2·1	0·52	1·9	0·35	0·8			27
9·55	2·1	0·52	1·9	0·4	1·1			28
0·55	2·1	0·5	1·7	0·4	1·1			29
0·52	1·8	0·5	1·7	0·45	1·4			30
0·5	1·7	0·42	1·2					31

Monthly Discharge of Ingram Creek, near Grand Prairie, for irrigation season, 1911

(Drainage area, 25 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rain fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	13	1	5·5	0·2	0·22	333	
May	52	15	28	1·1	1·27	1,666	
June	25	5·8	10·4	0·42	0·47	619	
July	12·7	1·7	5·0	0·2	0·23	298	
August	2·9	1·1	1·8	0·07	0·08	107	
September	1·7	0·5	1·1	0·04	0·04	65	
October			1·5				
November			1·5				
December			1·5				
The period							12

Note.—The estimated mean flow for the months of October, November and December, is 1·5 c.f.s. Accuracy, "A."

Daily Gauge Height and Discharge of Ingram Creek, near Grand Prairie, for 1912

Day.	April.		May.		June.		July.		August.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·65	3·0	1·6	47	1·35	23	0·95	7·1	0·75	4·2
2	0·65	3·0	1·6	47	1·35	23	1·0	8·0	0·7	3·6
3	0·7	3·6	1·6	47	1·25	17·3	1·05	9·3	0·7	3·6
4	0·7	3·6	1·65	53	1·25	17·3	1·05	9·3	0·7	3·6
5	0·7	3·6	1·7	60	1·2	14·7	1·0	8·0	0·7	3·6
6	0·75	4·2	1·7	60	1·15	12·7	1·05	9·3	0·7	3·6
7	0·75	4·2	1·75	67	1·15	12·7	1·05	9·3	0·7	3·6
8	0·8	4·8	1·8	71	1·1	10·7	1·0	8·0	0·7	3·6
9	0·8	4·8	1·75	67	1·1	10·7	1·0	8·0	0·65	3·0
10	0·8	4·8	1·75	67	1·05	9·3	0·95	7·1	0·65	3·0
11	0·82	5·2	1·8	74	1·1	10·7	0·95	7·1	0·65	3·0
12	0·85	5·5	1·85	82	1·15	12·7	1·0	8·0	0·65	3·0
13	0·95	7·1	1·9	90	1·2	14·7	1·0	8·0	0·65	3·0
14	1·2	14·7	1·95	97	1·25	17·3	0·95	7·1	0·7	3·6
15	1·4	27	2·0	105	1·35	23	0·9	6·3	0·7	3·6
16	1·2	14·7	2·05	112	1·45	31	0·9	6·3	0·7	3·6
17	1·2	14·7	2·15	130	1·45	31	0·85	5·5	0·75	4·2
18	1·3	20	2·15	130	1·4	27	0·85	5·5	0·7	3·6
19	1·3	20	2·05	112	1·35	23	0·8	4·8	0·65	3·0
20	1·4	27	2·05	112	1·25	17·3	0·8	4·8	0·65	3·0
21	1·5	36	1·95	97	1·2	14·7	0·75	4·2	0·65	3·0
22	1·6	47	1·85	82	1·15	12·7	0·75	4·2	0·65	3·0
23	1·55	41	1·8	74	1·05	9·3	0·75	4·2	0·65	3·0
24	1·65	53	1·8	74	0·95	7·1	0·75	4·2	0·65	3·0
25	1·6	47	1·75	67	0·95	7·1	0·75	4·2	0·65	3·0
26	1·55	41	1·65	53	0·9	6·3	0·7	3·6	0·65	3·0
27	1·45	31	1·6	47	0·9	6·3	0·7	3·6	0·65	3·0
28	1·4	27	1·6	47	0·95	7·1	0·7	3·6	0·65	3·0
29	1·5	36	1·45	31	0·95	7·1	0·75	4·2	0·65	3·0
30	1·55	41	1·4	27	1·0	8·0	0·8	4·8	0·65	3·0
31			1·4	27			0·75	4·2	0·65	3·0

MONTHLY DISCHARGE of Ingram Creek, near Grand Prairie, for Irrigation Season 1912.

(Drainage area, 25 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	53	3	19·8	0·8	0·9	1,178	
May	130	27	72·9	2·9	3·34	4,482	
June	31	6·3	14·8	0·6	0·67	881	
July	9·3	3·6	6·2	0·25	0·29	369	
August	4·2	3·0	3·3	0·13	0·15	203	
September			3				
October			2				
November			2				
December			2				
The period							15

NOTE.—The estimated mean flow for September is 3 c.f.s. For the remaining six winter months, it is about 2 c.f.s. Severe winter conditions exist generally from December to March.
Accuracy, "A" and "B."

JACKO CREEK (231).

Jacko creek has its source in the hills, 20 miles south of Kamloops, at an elevation of 3,800 feet, and discharges into Jacko lake near Kamloops, at an elevation of 2,200 feet. It is part of the Peterson-South Thompson drainage. The drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 13 square miles. Three small unnamed creeks enter from the right going upstream. Jacko creek is a small but very contentious irrigation stream in the most arid section of the Dry Belt. The summers are hot and dry, the winters long and cold (–30° F.)

Jacko creek, rising in a swamp, descends rapidly for about 6 miles through a densely wooded country, where it flows sluggishly through irrigable land to Jacko lake. The water in Jacko creek is subject to the records on Jacko lake and Peterson creek, of which it is the chief tributary. (See Peterson creek for further information.) In 1911 and for the preceding four years, no water reached Jacko lake; this fact formed the basis of bitter fights in the courts. From the observation made in 1912, it appears that there is an enormous loss of water due to seepage. With a discharge of 7 second-feet at the gauging station, there was no more than 2 second-feet lower down, all the irrigation ditches being closed.

The river station on Jacko creek was established above all diversions on May 1, 1912, by H. J. E. Keys. The measuring section is located about 100 feet above the Watson diversion, and 100 yards west of the Kamloops-Trout Lake road. A standard vertical staff gauge is located on the right bank at the measuring section. All measurements were made by wading. This is an excellent measuring section, with good control, high banks, uniform current and one permanent channel. The datum of the gauge is referred to one bench-mark.

DISCHARGE MEASUREMENTS of Jacko Creek, 12 miles south of Kamloops, 1912.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 18	H. J. E. Keys	1057	7·0	6·2	1·2	2·00	7·2
May 29	" "	1057	5·0	5·0	0·6	1·80	3·2
July 16	" "	1057	3·0	1·2	0·5	1·42	0·5

DAILY GAUGE HEIGHT AND DISCHARGE of Jacko Creek, 12 miles south of Kamloops for 1912.

Day.	May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·7	2·3	1·7	2·3	1·3	0·15	0	0·10	....	0·50
2		2·9	.....	1·9	...	0·50	1·2	0·05	1·5	0·85
3	1·8	3·4	1·6	1·5	1·5	0·85	....	0·35	....	1·20
4		3·4	.....	1·5	......	1·05	....	0·60	1·6	1·5
5		3·4	1·6	1·5	......	1·25	1·5	0·85	....	1·5
6	1·8	3·4	....	1·3	1·6	1·50	..	0·60	....	1·5
7		4·1	....	1·1	...	1·50	1·4	0·35	1·6	1·5
8	1·9	4·9	1·5	0·85	1·6	1·50	....	0·25	.....	1·20
9	...	5·6	......	0·60	.....	1·20	....	0·15	1·5	0·85
10		6·3	1·4	0·35	1·5	0·85	1·2	0·05	....	0·60
11	2·0	7·1	......	0·35	....	0·70	......	0·10	1·4	0·35
12		8·8	1·4	0·35	.	0·50	1·3	0·15	....	0·25
13	2·1	10·5	....	0·70	1·4	0·35	......	0·10	....	0·20
14		12·1	..	1·05	....	0·20	1·0	0·0	1·3	0·15
15		13·7	1·6	1·50	1·0	0·0	.....	0·50	....	0·15
16	2·2	15·3		1·20	..	0·0	.....	1·00	1·3	0·15
17		11·2	1·5	0·85	0·9	0·0	1·6	1·50	....	0·10
18	2·0	7·1	....	0·60	..	0·0	.....	1·50	....	0·10
19	..	6·0	1·4	0·35	......	0·0	1·6	1·50	1·2	0·05
20	1·9	4·9	.	0·35	....	0·0	.	1·20	....	0·05
21		4·9	.	0·35	..	0·05	1·5	0·85	1·2	0·05
22	1·9	4·9	1·4	0·35	1·2	0·05	..	0·60	.....	0·10
23		4·9	.	0·25		0·45	.....	0·40	1·3	0·15
24		4·9	1·3	0·15	1·5	0·85	1·3	0·15	....	0·10
25	1·9	4·9		0·15		1·05	.	0·15	.....	0·10
26		4·2	1·3	0·15		1·25	1·3	0·15	1·2	0·05
27	1·8	3·4	.	0·15	1·6	1·50	.....	0·15	....	[illegible]
28	..	3·4	.	0·15		1·20	1·3	0·15	....	[illegible]
29	1·8	3·4	1·3	0·15	1·5	0·85	...	0·15	....	[illegible]
30	.	2·8	....	0·15	....	0·50	....	0·15	....	[illegible]
31	1·7	2·3	...	....	1·3	0·15	1·3	0·15	....	

Monthly Discharge of Jacko Creek, 12 miles south of Kamloops, for 1912.
(Drainage area, 13 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	15·3	2·3	5·8	0·45	0·52	357	
June	2·3	0·15	0·74	0·06	0·06	44	
July	1·5	0·0	0·65	0·05	0·06	40	
August	1·5	0·0	0·45	0·03	0·04	28	
September	1·5	0·05	0·44	0·03	0·03	26	
The period							12

Note.—In 1911 four weeks, readings were obtained in June and July, at which time the creek dried up. These readings were taken on a gauge two miles below the present gauge, and only one measurement was obtained.
Accuracy, "B."

Jamieson Creek (232 and 233).

Jamieson creek [illegible] its source in the hills north of Tranquille Forest reserve, outside the Railway [illegible] at an elevation of 5,000 feet. It discharges into North Thompson river fr[illegible] the west, 18 miles north of Kamloops, at an elevation of 1,170 feet. It is part of the North Thompson drainage. Th[illegible] of the watershed is 66 square miles. The creek is in the Dry Belt and the wat[illegible] for irrigation. The mean annual precipitation is from 10 to 12 inches. Owing [illegible] influence of the valley of North Thompson river, the climate is a little cooler th[illegible] at Kamloops, and the snow remains on the ground much l[illegible]ger in the winter.

The water of Jamieson creek is used by the British Columbia Fruitlands Company for the irrigation of their lands along North Thompson and Thompson rivers. The intake is situated about [illegible] mile from the mouth of the creek. Water has to be used from Jamieson creek for this purpose for a number of years, but a new canal and flume line has recently been constructed by the company to replace the old system. The canal is lined with concrete to prevent seepage. Where necessary, galvanized steel fluming has been used and one inverted siphon of 48 inches diameter has been constructed of wood stave pipe. The main system is about [illegible] miles long, and will serve some 6,000 acres of the company's land. The British Co[illegible]nbia Fruitlands Company have constructed a storage dam on Wentworth lake, nea[illegible] the head of the creek, [illegible]t small storage has been secured.

The main station on Jamieson creek (232) is 100 feet above the British Columbia Fruitlands dam, and measures the total flow of the stream. It was established June [illegible], 1911, and gauge readings were taken till October 31, 1911, and from April 3 to October 31, 1912. The gauge is a 5 foot cedar staff nailed to a tree stump on the left bank of the stream, 100 feet above the British Columbia Fruitlands Company's dam. [illegible] datum is referred to three permanent bench-marks. The meter measurements were made by wading at a section 25 feet below the gauge. The channel is straight for 25 [illegible]t above the section, and the water swift. There is a straight channel with riffles, [illegible] 75 feet below the section, when the dam is reached. The right bank is a rock cliff, [illegible] feet high. The left bank is 3 feet high and covered with bushes, but is not very [illegible]ely to overflow. There is a gravel bar in the bed itself which, at a certain stage, divides the creek into two branches near the gauge. This occurs at a gauge height of 3·0 for a range of about 0·6 feet. Above that stage the water flows over the bar and below that stage, the second stream stops running. The gauge is only about 100 feet above the dam, and although there is considerable fall in that distance, the engineer should note particularly each trip that no change has been made at the dam to affect the height of the water at the gauge, and that there are still riffles between the gauge and the dam.

A second station (233) was established below the dam to show the amount of unused water, and to give some idea of the water diverted by the British Columbia Fruitlands ditch. It was found, however, that there was considerable loss by seepage from the stream into the gravel beds between the two stations. Hence, the amount of unused water is larger than the figures given by lower station; the amount of water diverted cannot be found by comparing the surface flow at the two stations. Gauge readings were taken at the lower station, from June 22, 1911 (when the station was established), to October 30, 1911, and from April 3 to July 12, 1912. The gauge readings at this station will not be continued another season.

DISCHARGE MEASUREMENTS of Jamieson Creek, below British Columbia Fruitlands Diversion, 1911-12.

Date.	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 21	C. G. Cline	1046	22	32·8	0·9	1·77	28·9
Oct. 7	Cline and Smith	1046	8	3·8	0·4	1·09	1·4
1912.							
May 10	E. M. Dann	1044	30	57	6·0	4·20	*343
June 5	Dann and Keys	1044	18	37	1·5	2·00	57
June 21	H. J. E. Keys	1057	9	8	1·1	1·43	8·7
July 8	"	1057	18	33	1·0	1·80	30

* Bridge measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Jamieson Creek, below British Columbia Fruitlands Diversion, for 1911.

Day.	June.		July.		August.		September.		October.	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.
1			1·5	11·5			1·0	0·1	1·25	3·5
2			1·5	11·5			0·9	0·0	1·25	3·5
3			1·45	9·5		creek dry.	1·0	0·1	1·25	3·5
4		..	1·35	6·0			1·0	0·1	1·2	2·5
5			1·2	2·5			1·0	0·1	1·2	2·5
6			1·2	2·5	0·6	0·0	0·9	0·0	1·2	2·5
7			1·15	1·5	1·6	0·1	0·8	0·0	1·15	1·5
8			1·2	2·5	0·6	0·0	0·7	0·0	1·15	1·5
9			1·45	9·5	0·5	0·0	0·8	0·0	1·15	1·5
10			1·4	7·5	0·4	0·0	0·9	0·0	1·15	1·5
11			1·3	4·5	0·3	0·0	0·75	0·0	1·2	2·5
12			1·3	4·5	0·5	0·0	0·65	0·0	1·2	2·5
13			1·2	2·5	0·7	0·0	0·65	0·0	1·15	1·5
14			1·1	0·5	0·6	0·0	0·6	0·0	1·15	1·5
15			1·0	0·0	0·1	0·0	1·45	9·5	1·25	3·5
16			1·0	0·0	0·2	0·0	1·45	9·5	1·25	3·5
17			0·9	0·0	0·0		1·45	9·5	1·2	2·5
18			0·6	0·0	0·1	creek	1·5	11·5	1·2	2·5
19			0·3	0·0	0	dry.	1·45	9·5	1·15	1·5
20			0·0	9·0	0	.....	1·4	7·5	1·15	1·5
21			1·5	11·5	0	..	1·4	7·5	1·15	1·5
22	1·7	23	0·9	0·0	0	......	1·25	3·5	1·15	1·5
23	1·95	48			0		1·15	1·5	1·15	2·5
24	2·0	55			0·6		1·15	1·5	1·1	0·5
25	1·6	16			0·8		1·15	1·5	1·1	0·5
26	1·6	16		creek	0·9		1·15	1·5	1·1	0·5
27	1·6	16		dry.	1·0	0·1	1·25	3·5	1·1	0·5
28	1·55	14			1·0	0·1	1·15	1·5	1·1	0·5
29	1·5	11·5			1·0	0·1	1·1	0·5	1·1	0·5
30	1·5	11·5			1·0	0·1	1·1	0·5	1·1	0·5
31					0·9	......				

MONTHLY DISCHARGE of Jamieson Creek, below British Columbia Fruitlands Diversion, for 1911.

(Drainage area, 66 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
July	11·5	0	2·8	·04	·05	172	
August	0·1	0	0·2	·00	·0	0·1	
September	11·5	0	2·7	·04	0·4	161	
October	3·5	0·5	1·8	·03	·03	111	
The period							12 to 15

NOTE.—Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Jamieson Creek, below British Columbia Fruitlands Diversion, for 1912.

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	2·5	2·3	104	2·4	124	1·1	0·5
2	....	2·5	2·4	124	2·3	104	1·2	2·5
3	1·2	2·5	2·5	145	2·2	86	1·2	2·5
4	1·2	2·5	2·6	167	2·1	70	1·0	0·1
5	1·2	2·5	2·6	167	2·0	55	1·2	2·5
6	1·2	2·5	2·7	192	1·8	32	1·2	2·5
7	1·3	4·5	2·8	220	1·8	32	1·4	7·5
8	1·2	2·5	3·1	310	1·8	32	1·5	11·5
9	1·4	7·5	3·2	343	1·8	32	1·6	16·0
10	1·4	7·5	3·3	376	1·8	32	1·6	16·0
11	1·4	7·5	3·3	376	1·8	32	1·4	7·5
12	1·4	7·5	3·3	276	1·8	32	1·2	2·5
13	1·4	7·5	3·4	410	1·8	32	......	......
14	1·4	7·5	3·5	445	1·9	42	......	......
15	1·6	16·0	3·7	515	2·0	55	......	......
16	1·6	16·0	3·7	515	1·9	42	......	......
17	1·8	32·0	3·5	445	1·8	32	......	......
18	1·7	25·0	3·5	445	1·7	23	......	......
19	1·8	32·0	3·4	410	1·6	1·6	......	......
20	1·8	32·0	3·5	445	1·5	11·5	......	......
21	1·8	32·0	3·6	480	1·3	4·5	......	......
22	1·8	32·0	3·5	445	1·3	4·5	......	......
23	1·8	32·0	3·4	410	1·1	0·5	......	......
24	1·7	23·0	3·1	310	1·0	0·1	......	......
25	1·9	42·0	3·1	310	1·0	0·1	......	......
26	1·9	42·0	3·0	278	......	......	......	......
27	2·0	55·0	3·1	310	......	......	......	......
28	2·0	55·0	2·9	248	......	......	......	......
29	2·1	70·0	2·7	192	......	......	......	......
30	2·3	104·0	2·6	167	......	......	......	......
31		......	2·5	145	......			......

MONTHLY DISCHARGE of Jamieson Creek, below British Columbia Fruitlands Diversion, for 1912.

(Drainage area, 66 square miles.)

Month.	Discharge in Second-Feet.			Run-Off.			Rainfall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	104	2·5	23·5	0·4	0·4	1,398	
May	515	104	317	4·8	5·5	19,500	
June	124	0	30·9	0·5	0·6	1,838	
The period							12

NOTE.—This station is unimportant and the same weight should not be given to these discharges as to those of the upper station.
Accuracy, "B."

DISCHARGE MEASUREMENTS of Jamieson Creek, above British Columbia Fruitlands Diversion, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
June 20	C. G. Cline	1046	24	28	2·2	2·35	61
Aug. 20	"	1046	19	13	0·6	1·78	8·4
Oct. 7	"	1016	20	15	0·5	1·82	7·6
1912.							
May 10	E. M. Dann	1046				3·60	354*
June 5	"	1046				2·50	85*
June 21	H. J. E. Keys	1057				2·30	58*
July 8	"	1057	23	31	1·8	2·33	56

* Discharge computed by adding discharge of diversions to discharge at lower station.

DAILY GAUGE HEIGHT AND DISCHARGE of Jamieson Creek, above British Columbia Fruitlands Diversion, for 1911.

Day.	June.		July.		August.		September.		October.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		....	2·35	62	1·9	12	1·7	3	1·95	16
2	. . .	. . .	2·2	40	1·85	10	2·4	69	1·95	16
3			2·25	34	1·85	10	2·2	40	1·95	16
4			2·15	34	1·8	7	2·2	40	1·95	16
5			2·1	28	1·8	7	2·2	40	1·95	16
6			2·1	28	2·0	19	2·2	40	1·9	12
7			2·15	34	2·3	54	2·2	40	1·9	12
8			2·2	40	2·3	54	2·2	40	1·9	12
9			2·4	69	2·25	47	2·2	40	1·9	12
10			2·3	54	2·4	69	2·2	40	1·9	12
11			2·25	47	2·3	54	2·15	34	1·9	12
12			2·25	47	2·3	54	2·3	54	1·9	12
13			2·2	40	2·2	40	2·2	40	1·9	12
14			2·15	34	2·2	40	2·15	34	1·9	12
15			2·1	28	2·1	28	2·15	34	2·05	24
16			2·1	28	2·0	19	2·1	28	2·1	28
17			2·05	24	2·0	19	2·1	28	2·1	28
18			2·1	28	2·0	19	2·1	28	2·0	19
19			2·05	24	1·9	12	2·1	28	2·0	19
20		. . .	2·1	28	1·85	10	2·1	28	1·9	12
21		. . . . .	2·1	28	1·85	10	2·1	28	1·9	12
22	1·9	12	2·1	28	1·8	7	2·05	24	1·9	12
23	2·25	47	2·0	19	1·8	7	2·05	24	1·9	12
24	2·3	54	1·9	12	1·75	5	2·0	19	1·9	12
25	1·95	16	1·9	12	1·75	5	2·0	19	1·9	12
26	2·25	47	1·9	12	1·7	3	2·0	19	1·9	12
27	2·35	62	1·9	12	1·75	5	1·95	16	1·9	12
28	2·35	62	1·9	12	1·7	3	1·95	16	1·9	12
29	2·3	54	1·9	12	1·7	3	1·9	12	1·9	12
30	2·25	47	1·9	12	1·7	3	1·9	12	1·9	12
31		. .	1·9	12	1·7	3	. . .	. .		. . .

MONTHLY DISCHARGE of Jamieson Creek, above British Columbia Fruitlands Diversion, for 1911.

(Drainage area, 65 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
July	69	12	29·7	0·46	0·53	1,830	
August	69	3	20·6	0·32	0·37	1,270	
September	69	3	30·6	0·47	0·52	1,820	
October	28	12	14·6	0·22	0·25	898	
The period					....	......	12

NOTE.—Station was established June 22, artificial control.
Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of Jamieson

Day.	April.		May.		June.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	2·7	122	2·8	143
2	....	....	2·8	143	2·8	143
3	1·4	0	2·9	166	2·7	122
4	1·4	0	3·0	190	2·6	103
5	1·4	0	3·0	190	2·5	85
6	1·4	0	3·1	215	2·5	85
7	1·7	3	3·2	240	2·5	85
8	1·7	3	3·5	325	2·5	85
9	1·8	7	3·6	350	2·5	85
10	1·8	7	3·7	380	2·5	85
11	2·0	19	3·7	380	2·5	85
12	2·0	19	3·7	380	2·5	85
13	2·0	19	3·8	410	2·6	103
14	1·8	7	3·9	440	2·6	103
15	2·0	19	4·1	500	2·7	122
16		19	4·1	500	2·6	103
17	2·2	40	3·9	440	2·5	85
18	2·1	28	2·9	440	2·5	85
19	2·2	40	3·8	410	2·3	54
20	2·2	40	3·9	440	2·3	54
21	2·3	54	4·0	470	2·2	40
22	2·3	54	3·9	440	2·2	40
23	2·3	54	3·8	410	2·2	40
24	2·4	69	3·5	325	2·2	40
25	2·5	85	3·5	325	2·1	28
26	2·5	85	3·4	295	2·1	28
27	2·6	103	3·5	325	2·2	40
28	2·6	103	3·3	265	2·2	40
29	2·7	122	3·1	215	2·2	40
30	2·8	143	3·0	190	2·3	54
31	.	.	2·9	166	...	

Creek, above British Columbia Fruitlands Diversion, for 1912.

July.		August.		September.		October.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
2·5	85	2·4	69	2·4	69	2·0	19	1
2·6	103	2·3	54	2·6	103	2·0	19	2
2·6	103	2·3	54	2·5	85	2·0	19	3
2·4	69	2·2	40	2·5	85	1·9	12	4
2·4	69	2·2	40	2·4	69	1·9	12	5
2·4	69	2·2	40	2·4	69	2·0	19	6
2·4	69	2·0	19	2·2	40	2·0	19	7
2·3	54	1·9	12	2·6	103	2·0	19	8
2·3	54	2·0	19	2·8	143	2·1	28	9
2·3	54	2·0	19	2·6	103	2·1	28	10
2·2	40	2·0	19	2·5	85	2·1	28	11
2·2	40	2·0	19	2·4	69	2·1	28	12
2·2	40	1·9	12	2·4	69	2·1	28	13
2·2	40	1·9	12	2·4	69	2·1	28	14
2·2	40	2·0	19	2·3	54	2·1	28	15
2·2	40	2·1	28	2·3	54	2·1	28	16
2·2	40	2·6	103	2·3	54	2·2	40	17
2·2	40	2·8	143	2·3	54	2·3	54	18
2·1	28	2·6	103	2·3	54	2·3	54	19
2·0	19	2·5	85	2·3	54	2·2	40	20
1·9	12	2·4	69	2·3	54	2·2	40	21
2·8	143	2·2	40	2·3	54	2·3	54	22
3·0	190	2·2	40	2·2	40	2·2	40	23
3·0	190	2·0	19	2·2	40	2·2	40	24
3·0	190	2·0	19	2·1	28	2·3	54	25
2·9	166	2·0	19	2·1	28	2·4	69	26
2·8	143	1·9	12	2·1	28	2·3	54	27
2·6	103	2·1	28	2·1	28	2·3	54	28
2·4	69	2·2	40	2·1	28	2·3	54	29
2·4	69	2·2	40	2·0	19	2·3	54	30
2·2	40	2·3	54			2·3	54	31

MONTHLY DISCHARGE of Jamieson Creek, above British Columbia Fruitlands Diversion, for 1912.

(Drainage area, 65 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	143	0·0	38·0	0·58	0·65	2,261	
May	500	122	325	5·0	5·8	20,000	
June	143	28	76·3	1·2	1·3	4,540	
July	190	12	77·8	1·2	1·4	4,780	
August	143	12	41·6	0·64	0·74	2,560	
September	143	19	61·1	0·94	1·0	3,640	
October	54	12	36·0	0·56	0·64	2,210	
The period							[illegible]

NOTE.—Artificial control.
Accuracy, "B."

The following float measurements of the discharge of Jamieson creek are published by the courtesy of Mr. Arthur Meighan, C.E., engineer of the British Columbia Fruitlands Company, who made them during the seasons of 1907, 1908 and 1909. Measured at Headgates (C.P.R. ditch).

Date.	Sec.-feet.	Date.	Sec.-feet.
1907.		1908.	
April 13	4·2	April 22	67
" 20	3·5	" 24	72
" 29	18·3	" 26	80
May 8	247·7	" 28	80
" 13	268·8	" 29	71
" 19	315·9	May 1	103·7
" 19 (p.m.)	1,400 (cloud burst)	" 2	206 (rain
" 20	315·9	" 5	220
" 28	414·5	" 6	284
June 5	294·9	" 8	480
" 19	176·0	" 16	583
" 21	143·6	June 4	380
" 23	143·6	" 6	360
" 24	71·3	" 7	336
July 21	34·9	" 9	225
" 27	33	" 10	232
Aug. 3	18·7	" 11	156
" 9	15	" 12	125
" 12	29	" 13	125
" 17	58 (rain)	" 14	111
" 18	76·8	" 16	93
" 21	46	" 18	96 (rain
" 24	38	" 19	140
" 27	27	" 21	113
" 31	22·5	" 23	113
		" 25	72
1908		" 26	77
		" 28	132
April 10	4	" 30	102
" 17	5·7	July 3	63
" 20	10	" 5	47
" 21	41	" 6	47

Date.	Sec.-feet.	Date.	Sec.-feet.
1908.		1909.	
July 12	43	June 12	134
" 16	40	" 13	120
" 22	29	" 14	98
" 31	25	" 15	86
Aug 14	20	" 17	70
" 30	10	" 20	50
1909		" 23	rain
		" 24	"
		" 25	110
April 4	6	" 26	135 (rain)
May 1	6	" 27	150
" 4	22	" 28	140
" 5	22	" 30	130
" 6	18	July 1	119
" 8	25	" 2	110
" 11	46	" 3	80
" 12	53	" 6	50
" 13	71	" 7	heavy rain
" 14	81	" 8	100
" 15	91	" 10	85
" 16	83	" 12	rain
" 17	100	" 17	"
" 21	112	" 20	100
" 22	117	" 25	50 (rain)
" 23	120	" 26	rain
" 24	202	" 27	65
" 26	452	" 31	45
" 27	452	Aug. 2	40
" 31	354	" 5	40
June 1	404	" 8	42
" 2	621 (rain)	" 11	40
" 3	453	" 15	37
" 5	308	" 17	35
" 6	243	" 18	30
" 7	186	" 20	25
" 8	186	" 23	20
" 10	150	" 31	10
" 11	134		

Jones Lake and Creek (125).

Jones creek rises in Jones lake, which is situated in the northwesterly part of township 3, range 27, west of the 6th meridian, and which is at an elevation of 1,950 feet. The creek discharges into Fraser river near Ruby creek in section 19, township 1, range 27, at an elevation of 100 feet. It is part of the Fraser drainage. Boulder creek enters from the east just below Jones lake. The area of the watershed above the outlet of the lake is 40 square miles. The water is not used at present, but it is proposed to use it for the development of power. Careful hydrographic studies have been made at Jones lake during 1911 and 1912 by Anderson and Warden, civil engineers, Vancouver, acting for the Vancouver Power Co. They give the precipitation for the year period from April 1, 1911 to April 1, 1912, as 77 inches. They established a gauging station on Jones creek at the outlet from Jones lake and another on Boulder creek near the mouth, and regular gauge readings have been taken since May 21, 1910.

Jones lake is situated in a valley high up in the spur of the Cheam mountains, east and north of the town of Chilliwack, and about seven miles east of Agassiz. The waters flow in a northerly direction for about 6 miles, discharging into Fraser river.

The drainage area of 40 square miles lies mostly above the 3,000-foot level, and some of the surrounding mountains are 8,000 feet high. The land near the lake is covered with an inferior growth of timber, mostly of spruce and cedar. The ravines and gullies have a thick growth of fern and devil's club.

The area of Jones lake is 1,263 acres. The shores of the lake rise abruptly from the water, except where small creeks enter; here there are to be found low flats and swamps. At the 50-foot contour, the area of the lake or reservoir would be about 2,300 acres.

The construction of six-mile pipe line down Jones Creek valley to the Fraser would be very expensive, and the maintenance of such a construction would be difficult. The development proposed by the Vancouver Power Co. is by means of a tunnel from the lake at its most westerly point, extending through the mountains to the Fraser valley. This tunnel would be 10,200 feet long, and from its outlet to the power-house the water would be conveyed in pressure pipes, 6,000 feet long. In this way an effective head of 1,800 feet would be obtained.

The records of run-off by Messrs. Anderson and Warden show a mean flow of about 160 cubic feet per second.

Kicking Horse River (110-112).

Kicking Horse river rises in Wapta lake near the Kicking Horse pass, at an elevation of 5,200 feet. It flows in a general westerly direction for about 45 miles, and empties into Columbia river at Golden. Its main tributaries are (in ascending order from the mouth): Glenogle creek, Porcupine creek, Beaverfoot river, Otterhead river, Ottertail river, Amiskwi river, Emerald river, Yoho river, Cathedral creek and Sherbrooke creek. Of these, the Yoho river has by far the greatest maximum discharge.

Kicking Horse river drains an area of 700 square miles of very mountainous country. The river is mostly glacial-fed, with a large run-off in June, July and August, and a small discharge in the winter.

The precipitation varies from 14 inches in the Columbia valley at the mouth to over 70 inches at its head-waters in the summit of the Rockies, particularly in the Yoho valley, where the snowfall is very large.

The summer days are hot but short, and the nights cool. The winters are cold and severe, with a temperature sometimes down to -40° F. Snow falls at all seasons on the tops of the high mountains; and generally about the middle or end of October it snows in the Kicking Horse pass, to remain all winter. The river itself freezes over night during the latter part of October, and solidly late in November, breaking about the first week of April.

There is some valuable timber along many of the tributaries of the Kicking Horse, and the river is used a little at its lower end for log driving. There is also some mining done on several tributaries (Cathedral and Ice rivers). Most of the Kicking Horse drainage lies within Yoho Park reserve, and the scenic beauty of the river and vicinity is well known to all who have toured the Canadian Rockies over the C.P.R.

The river flows mostly through narrow canyons and gorges, particularly [illegible] upper and lower [illegible]. At Field the river [illegible] through wide gravel flats.

There are several places where [illegible] developments are practicable.

At Kicking Horse [illegible] Wapta falls, 3 miles from Leanchoil, and about 2[illegible] from Golden, [illegible] with a small dam just above the head [illegible]. Near the falls, the river is about 150 feet [illegible] [illegible] in the [illegible]. A tunnel 200 yards long would be necessary through the left bank for penstock [illegible] site is in the valley of a small creek just below falls. No large storage is av[illegible] anchor and frazil ice would have to be contended with, winter conditions being severe. Minimum flow is about 150 cubic feet per second; the falls are about 150 yards below the mouth of the Beaverfoot river, and the discharge is almost the same as recorded at the river station at Golden (q.v.).

Another power site is just below the Natural Bridge near Field, fall of 70 feet, with 12 more in rapids in a distance of 200 yards. There is a narrow canyon about 50 feet wide with sheer rock walls 30 feet high at the head of the canyon, and nearly 100 feet high at the foot. The power could best be developed by a diverting dam at the head of the canyon, the water being conducted by a pipe through a 20-foot cut in the left bank to a power site just below canyon. Practically no storage is obtainable. The scenic interest of the Natural Bridge must not be interfered with.

The discharge at the proposed power site is about that at the river station called Kicking Horse River at Field.

There are also several power developments possible on Kicking Horse river above the mouth of Yoho river. By pipe-line construction, heads of from 350 to 800 feet are available. Small storage could be secured in Sherbrooke and Wapta lakes. The run-off is small. See discharge data at river station called Kicking Horse river at No.2 tunnel.

Three river stations were established on Kicking Horse river: (1) At Golden (110)near the mouth, established in October, 1911; (2) Kicking Horse river at Field (111), just below the mouth of Yoho river, established in June, 1912; and (3) Kicking Horse River at No. 2 tunnel (112) just above the mouth of Yoho river, established June, 1912. A station was also established on the Yoho, but the gauge was washed out by the excessive floods in June, and was not replaced. The difference between the discharges at the two upper stations on the Kicking Horse should give the flow of the Yoho very nearly. The stations were all continued until freeze-up at the end of October.

Kicking Horse River at Golden (110).

The station was established on the Kicking Horse river at Golden on October 18, 1911, by C. E. Richardson. The measuring section is located on the downstream side of the lower traffic bridge at Golden, about 1 mile from the mouth of the river. The gauge is a vertical staff 2 inches by 4 inches by 8 feet (cedar), marked in the feet and tenths in black paint. It is fastened to a breakwater on the right side of the river (facing downstream) and on the downstream side of the bridge. Measurements were made with Price's electric current meter (small) and from 6½ to 15 pounds of lead, handled by a cable. The initial point for sounding is at the new breakwater abutment on the right side of the bridge. The channel above and below the station is straight for 100 yards, and the water is swift. During low water the river is confined to one channel, about 5 feet deep, but during the freshet shortly above the station the water enters a side channel which, at extremely high water, is 3 feet or 4 feet deep. This channel empties into the Columbia about 150 yards above the regular mouth of the Kicking Horse. The bed of the river at the station is gravel, but not very liable to shift. There is a permanent gravel bar some 100 yards below the station. When the river is low in the winter and freezes over, anchor ice coming down the river from the rapids above catches on this bar. The water is backed up behind the ice for one-half a mile where the river remains open, and then flood out [illegible] surface of the ice. [illegible] the ice in February, 1912, at the [illegible] in places 5 feet thick. The channel is about 150 feet wide, but in February, 1912, 125 feet of this 150 feet was choked with anchor ice, and the stream was in a channel 25 feet wide.

During the open season conditions are suitable for accurate measurements, as the results obtained show.

The following bench-marks were located with reference to the gauge datum.

B.M. No. 1.—Head of 5-inch spike in the downstream side of the right abutment. Elevation, 6'·44.

B.M. No. 2.—Near B.M. Elevation, 7'·55.

B.M. No. 3.—Same as B.M., on upstream side of right abutment. Elevation 7'·11.

DISCHARGE MEASUREMENTS of Kicking Horse River, at Golden, B.C., 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 18	C. Richardson	1048	95	289	1·7	3·72	491
1912.							
Feb. 22	"	1047	25	185	0·93		172
May 24	C. Richardson and H. Hughes	1055	90	430	4·3	3·48	1,840
June 4	" "	1055	103	372	2·7	2·64	1,000
June 8	" "	1048	158	567	4·2	3·9	2,380*
June 24	" "	1055	203	928	6·4	5·64	5,970*
July 26	" "	1055	176	604	4·7	4·26	2,830*
Sept. 26	"	1055	99	363	2·8	2·48	1,030
Oct. 1	"	1055	100	351	2·6	2·36	930
July 12	H. C. Hughes	1055	178	654	5·2	4·6	3,400*

*Water running in side channel.

Daily Gauge Height and Discharge of Kicking Horse river, at Golden, B.C., for 1914.

Day	October Gauge height	October Discharge	November Gauge height	November Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.
1			1.20	160
2			1.20	160
3			1.60	365
4			1.60	365
5			1.58	350
6			1.30	200
7			1.10	130
8			0.95	100
9			0.92	95
10			0.95	100
11				
12				
13				
14				
15				
16				
17				
18	1.72	450		
19	1.70	435		
20	1.70	435		
21	1.68	420		
22	1.65	400		
23	1.62	380		
24	1.65	400		
25	1.60	365		
26	1.50	295		
27	1.40	240		
28	1.38	230		
29	1.35	220		
30	1.30	200		
31	1.28	190		

DAILY GAUGE HEIGHT AND DISCHA[illegible]

Day	April		May		June		July	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.65	400	2.80	1,340	4.42	[illegible]
2			1.50	295	2.90	1,510	4.60	[illegible]
3			1.50	295	2.75	1,220	4.50	3,180
4			1.50	295	2.50	1,100	4.30	2,900
5			1.50	295	2.45	980	4.35	2,900
6			1.55	330	2.55	1,060	4.62	[illegible]
7			1.60	365	2.90	1,340	4.65	3,400
8			1.95	610	3.90	2,370	4.50	3,180
9	1.25	180	2.25	830	[illegible]	2,960	4.50	3,180
10	1.25	180	2.25	830	4.25	2,820	4.55	3,210
11	1.35	220	2.20	795	4.45	3,100	4.55	3,210
12	1.50	295	2.25	830	4.85	3,760	4.62	3,350
13	1.45	270	2.65	1,140	5.40	5,010	4.70	[illegible]
14	1.35	220	3.35	1,765	5.00	4,070	4.55	3,210
15	1.35	220	3.90	2,370	4.80	3,660	4.40	3,010
16	1.40	240	4.10	2,620	4.70	3,480	4.42	3,060
17	1.35	220	3.90	2,370	4.85	3,770	4.15	[illegible]
18	1.30	200	3.60	2,030	5.00	4,070	4.35	2,900
19	1.30	200	3.45	1,865	5.15	4,400	4.45	3,100
20	1.32	210	3.40	1,815	5.30	4,770	4.50	3,180
21	1.30	200	3.25	1,665	5.35	4,900	4.30	2,900
22	1.35	220	3.40	1,815	5.38	4,990	4.42	3,060
23	1.40	240	3.40	1,815	5.55	5,560	4.25	2,820
24	1.48	288	3.40	1,815	5.55	5,560	4.45	3,100
25	1.50	295	3.45	1,865	5.50	5,370	4.30	2,900
26	1.40	240	3.90	2,370	5.62	5,870	4.35	2,900
27	1.40	240	4.20	2,755	5.58	5,680	4.15	2,900
28	1.35	220	3.90	2,370	5.48	5,300	4.05	[illegible]
29	1.75	[illegible]	3.52	1,940	4.82	3,700	4.25	[illegible]
30	1.60	365	3.32	1,740	4.68	3,410	4.30	2,900
31			3.05	1,480			[illegible]	[illegible]

of Kicking Horse river, at Golden, B.C., for 1912.

August		September		October		November		Day
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
4·60	3,320	3·75	2,190	2·31	800	1·62	580	1
4·60	3,520	3·55	1,970	2·17	775	1·62	580	2
4·15	3,100	3·52	1,940	2·17	775	1·82	575	3
4·85	3,760	3·55	1,970	2·47	1,000	1·82	520	4
4·70	3,480	3·48	1,900	2·35	910	1·82	520	5
4·38	3,010	3·40	1,820	2·28	855	1·77	485	6
4·05	2,560	3·42	1,840	2·25	830	1·77	485	7
4·12	2,680	3·38	1,800	2·30	870	1·72	455	8
4·70	3,180	3·35	1,760	2·22	810	1·77	485	9
4·55	3,210	3·28	1,700	2·20	795	1·70	435	10
4·30	2,900	3·38	1,800	2·18	780			11
4·10	2,600	3·60	2,020	2·10	720			12
5·02	2,400	3·65	2,080	2·10	720			13
2·80	2,250	3·45	1,860	2·10	720			14
4·10	2,620	3·25	1,660	2·10	720			15
4·50	3,180	3·18	1,600	2·10	720			16
4·40	3,040	3·22	1,610	2·38	930			17
4·20	2,760	3·00	1,430	2·20	755			18
4·30	2,900	2·90	1,310	2·20	795			19
4·30	2,900	2·78	1,210	2·12	735			20
4·40	3,010	2·70	1,180	2·08	705			21
4·50	3,180	2·70	1,180	2·10	720			22
4·75	3,570	2·65	1,140	2·05	680			23
5·35	4,900	2·58	1,080	2·00	645			24
5·75	6,720	2·52	1,010	2·00	615			25
5·10	4,200	2·48	1,000	1·95	610			26
4·78	3,620	2·42	965	1·95	630			27
4·65	3,100	2·40	915	1·90	575			28
4·35	2,960	2·32	885	1·80	505			29
4·08	2,600	2·25	850	1·70	415			30
3·92	2,100			1·65	400			31

MONTHLY DISCHARGE of Kicking Horse River, at Golden, B.C., for 1912.
(Drainage area, 700 square miles.)

Month.	Discharge in Second Feet. Maximum	Minimum	Mean	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet.	Rain Fall. In.
April	365	180	224	0·32	0·3[illegible]	[illegible]	
May	2,764	295	1,410	2·0	2·3	86,700	
June	5,870	980	3,570	5·1	5·7	212,000	
July	3,480	2,560	3,080	4·4	5·1	189,000	
August	6,720	2,250	3,250	4·6	5·3	199,000	
September	2,190	830	1,530	2·2	2·5	91,000	
October	1,000	400	731	1·04	1·2	44,900	
The period							[illegible]

NOTE.—Freeze-up occurred in 1911 on November 11. Channel opened in 1912 on April 8. Freeze-up occurred in 1912 about the middle of November. On November 9, 1911, the discharge was 45 c.f.s. (open conditions). On February 22, 1912, the discharge was 172 c.f.s. (under ice cover). There is a possibility of an ice jam having formed in the stream about the 8th of November, 1911, above the gauge.

Accuracy, "A".

KICKING HORSE RIVER AT FIELD (111).

The station was established on Kicking Horse river at Field on June 6, 1912, by C. E. Richardson. The measuring section is located on the first traffic bridge on the Yoho road after leaving Brewster's stable, and is about 3½ miles above Field. A chain gauge of length 13'·5 was installed on the downstream side of the above mentioned bridge, and the rise and fall of the stream is recorded in feet and tenths on one of the beams. Measurements were made with Price's electric current meter (small) and 15 pounds of lead suspended by a cable. The initial point for sounding is the left abutment on the downstream side of the bridge. The channel above and below the station is straight for 100 yards, and the water is very fast. The river is confined between the bridge abutments at all stages. The bed of the stream is gravelly, and the depth of the water varies from 2 feet to 8 feet.

The following bench-marks were established with reference to the gauge datum:

B.M. No. 1. Four inch spike in a fir tree on the left bank of the stream 50 feet from the bridge and 20 feet below the road. Elevation, 11'·56.

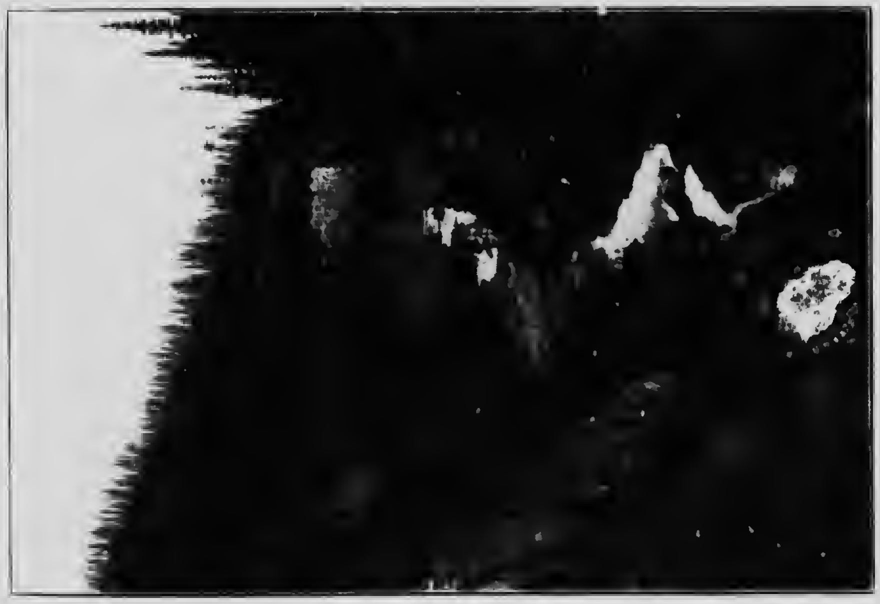
B.M. No. 2. On a flat rock 12 feet from B.M. Elevation, 12'·63.

B.M. No. 3. On a large rock on the left bank, 30 feet from the river and 70 feet below the road. Elevation, 11'·70.

An idea of the amount of precipitation in the Yoho valley and Upper Kicking Horse may be obtained by comparing the run-off depth in inches obtained from this station and that obtained in Golden, where the amount of precipitation is known.

An interesting point to note is the difference in flow in the morning and evening. Kicking Horse river at the Field station varies 2,000 c.f.s. on a hot day.

Looking up from foot of Kicking Horse Canyon.



Kicking Horse River, near Field, B.C.

DISCHARGE MEASUREMENTS of Kicking Horse River, at Field, B.C. 1912.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 6	C. E. Richardson........	1048	58	120	2·5	4·4	295
June 25..	"	1048	111	403	8·9	7·0	3,600
June 26..	"	1048	139	488	9·6	7·6	4,710
June 27.	"	1048	105	325	8·0	6·4	2,620
July 2.	"	1048	86	272	7·1	6·0	1,940
Aug. 13	"	1048	73	192	5·0	5·35	960
Oct. 2 .	"	1055	53	102	2·1	3·7	214
Nov. 14	"	1014	45	76	1·6	3·1	117

DAILY GAUGE HEIGHT AND DISCHARGE of Kicking Horse river, at Field, B.C., for 1912.

Day.	June.		July.		August.		September.		October.		November.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft
1.			6·0	1,940	6·45	2,670	4·95	595	3·8	200	3·2	120
2..			6·1	2,100	6·45	2,670	4·8	500	3·7	185	3·2	120
3...		mean	5·8	1,620	6·6	2,930	4·7	450	3·75	192	3·2	120
4....		200	5·85	1,700	6·7	3,100	4·6	405	3·8	200	3·2	120
5....			5·95	1,860	6·45	2,670	4·55	385	3·75	192	3·2	120
6 .	4·40	330	5·95	1,860	5·95	1,860	4·5	365	3·7	185	3·2	120
7..	4·83	518	5·85	1,700	6·05	2,020	4·5	365	3·7	185	3·2	120
8..	5·13	743	5·75	1,550	6·20	2,260	4·5	365	3·7	185	3·2	120
9..	5·33	960	5·9	1,780	6·45	2,670	4·5	365	3·6	170	3·2	120
10..	5·38	1,030	5·8	1,620	6·25	2,340	4·55	385	3·6	170	3·2	120
11....	5·53	1,230	6·05	2,020	6·05	2,020	4·7	450	3·6	170	3·2	120
12....	5·83	1,670	5·9	1,780	5·85	1,700	4·9	560	3·5	155	3·2	120
13....	6·28	2,380	6·0	1,940	5·75	1,550	4·85	530	3·5	155	3·2	120
14....	5·78	1,600	5·55	1,260	5·95	1,860	4·65	430	3·5	155	3·2	120
15....	5·63	1,370	5·9	1,780	6·05	2,020	4·6	405	3·5	155	3·2	120
16....	5·73	1,520	5·9	1,780	5·95	1,860	4·6	405	3·5	155	3·2	120
17...	5·93	1,830	6·0	1,940	5·65	1,400	4·45	350	3·5	155		
18....	6·18	2,220	6·1	2,100	5·6	1,320	4·35	315	3·5	155		
19....	6·33	2,470	6·1	2,100	5·65	1,400	4·15	265	3·5	155		
20....		2,760	6·15	2,180	5·8	1,620	4·05	245	3·4	140		
21....	....	2,920	6·05	2,020	6·0	1,940	4·05	245	3·4	140		
22....	....	3,260	6·25	2,340	6·2	2,260	4·05	245	3·4	140		
23....	....	3,620	6·15	2,180	6·55	2,840	3·9	215	3·4	140		
24....	.	3,810	6·1	2,100	7·3	4,180	3·85	208	3·4	140		
25....	7·2	4,000	6·05	2,020	7·05	3,720	3·8	200	3·4	140		
26....	7·4	4,380	5·8	1,620	6·4	2,580	3·8	200	3·4	140		
27....	......	3,6[illegible]0	5·7	1,480	6·1	2,100	3·75	192	3·4	140		
28....	.	2,920	5·75	1,550	5·75	1,550	3·7	185	3·4	140		
29....	6·2	2,260	6·15	2,180	5·4	1,050	3·7	185	3·3	130		
30....	.	2,100	6·45	2,670	5·2	810	3·7	185	3·3	130		
31....	.	..	6·50	2,760	5·05	670	....	......	3·3	130		

MONTHLY DISCHARGE of Kicking Horse river, at Field, for 1912.

(Drainage area, 130 square miles.)

Month.	Discharge in Second Feet.				Run Off.	
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	4,380	200	1,880	14·4	16·1	111,900
July..	2,760	1,260	1,920	14·8	17·0	118,000
August.	4,180	670	2,120	16·3	18·8	130,300
September.	595	185	340	2·6	2·9	20,200
October..	200	130	159	1·2	1·4	9,780
November..	120	120	120	0·92	1·03	7,140

NOTE.—The maximum flow of 4,760 c.f.s., which took place on June 26, lasted only a few hours, the mean flow for the day being 4,380 c.f.s. Freeze-up occurred about November 20, 1912. Accuracy, "A" and "B".

KICKING HORSE RIVER AT NO. 2 TUNNEL (412).

The station on Kicking Horse river at No. 2 tunnel was established on June 28, 1912, by C. E. Richardson. The measuring section is located three-quarters of a mile above the mouth of Yoho river, 25 yards above the C.P.R. bridge between No. 1 and No. 2 tunnels, and five miles from Field via the old C.P.R. grade, which is now used as a wagon road. The gauge is a vertical staff, 2 inches by 4 inches by 7 feet (cedar), marked in feet and tenths with blue paint. It is fastened to a crib on the right bank of the stream (looking downstream) 25 yards above the C.P.R. bridge, between No. 1 and No. 2 tunnels. At low stages, measurements are made by wading, but during high water it is impossible to wade, and measurements are made by stretching across the stream an endless cable, to which a pulley is fastened. A cable on which the meter is suspended is passed through this pulley. The meter may be located at any desired point by means of the endless cable. Price's electric current meter is used in all measurements on this stream. The channel above and below the station is straight for about 50 feet. The water is swift, particularly below, where a riffle affords good control. The banks of the stream rise vertically for 5 feet, and then are gradually sloping. During high water a small side channel is formed to the left of the regular section, but the percentage of water which flows through it is very small so that it has little effect on the gauge. The bed of the stream is composed of silt and small gravel, but, due to the good control, the possibility of shifting is very small. The depth of the channel varies from 1 foot to 5 feet.

The following bench-marks were located and referred to the gauge datum:—

B.M. No. 1.—Nail in the downstream end of second log in a small shack directly across the stream from the gauge. Elevation 6′ ·19.

B.M. No. 2.—Nail driven in top of stump 20 feet to the right and below the gauge. Elevation 8′ ·80.

B.M. No. 3.—Top of right abutment on upstream side of the C.P.R. bridge, between No. 1 and No. 2 tunnels; also a C.P.R. bench-mark. Elevation 29′ ·86.

B.M. No. 3.—Elevation above sea-level, 4,635′ ·4.

Elevation of gauge datum above sea-level, 4,605′ ·54.

Discharge Measurements of Kicking Horse river, at No. 2 Tunnel, 1912.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 28..	C. E. Richardson.	1,048	39	110	4·0	5·0	470*
July 2.	"	1,048	37	84	3·6	4·2	299
Aug. 5.	"	1,048	37	94	3·9	4·45	378
Aug. 13.	"	1,048	36	81	3·3	3·88	270
Oct. 2..	"	1,055	30	27	2·2	2·08	60†
Nov. 19	"	1,044	15	12	2·7	1·73	31†

*29 c.f. in side channel.
†Different section.

Daily Gauge Height and Discharge of Kicking Horse River, at No. 2 Tunnel, for 1912.

Day.	July.		August.		September.		October.		November.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	4·15	306	4·3	333	3·05	150	2·1	60	1·8	40
2	4·25	324	4·4	351	3·0	144	2·1	60	1·75	37
3	4·3	333	4·3	333	2·95	138	2·1	60	1·7	34
4	4·05	288	4·45	360	3·0	144	2·1	60	1·8	40
5	4·1	297	4·2	315	2·8	122	2·1	60	1·8	40
6	4·25	324	4·5	370	2·8	122	2·1	60	1·8	40
7	4·3	333	4·15	306	2·75	117	2·0	53	1·8	40
8	4·25	324	4·1	297	2·7	112	2·0	53	1·8	40
9	4·25	324	4·2	315	2·7	112	2·0	53	1·8	40
10	4·3	333	4·2	315	2·7	112	2·0	53	1·8	40
11	4·4	351		298	2·7	112	2·0	53	1·7	34
12	4·25	324	4·05	288	2·9	133	2·0	53	1·7	31
13	4·35	342	3·95	272	2·85	128	2·0	53	1·7	31
14	4·45	360	3·9	264	2·75	117	2·0	53		
15	4·15	306	4·0	280	2·6	102	1·95	50		
16	4·2	315	4·25	324	2·6	102	1·9	46		
17	3·85	256	4·5	370	2·5	93	1·9	46		
18..	3·85	272	4·4	351	2·5	93	1·9	46		
19	4·15	306	4·4	351	2·4	84	1·9	46		
20	4·15	306	4·5	370	2·4	84	1·9	46		
21	4·05	288	4·4	351	2·3	76	1·9	46		
22	4·05	288	4·5	370	2·3	76	1·9	46		
23	4·15	306	4·6	390	2·3	76	1·9	46		
24	4·15	306	6·2	784	2·2	68	1·9	46		
25	4·15	306		500	2·2	68	1·9	46		
26	4·2	315		350	2·2	68	1·9	46		
27	4·2	315		300	2·15	64	1·8	40		
28	4·0	280		250	2·1	60	1·8	40		
29	4·0	280		225	2·1	60	1·8	40		
30	4·05	288		200	2·1	60	1·8	40		
31	4·2	315		175			1·8	40		

MONTHLY DISCHARGE of Kicking Horse River, at No. 2 Tunnel, for 1912.

(Drainage area, 50 square miles.)

Month.	Discharge in Second Feet.				Run Off.	
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
July..	360	256	310	6·2	7·1	19,100
August	784	175	334	6·7	7·7	20,500
September.	150	60	100	2·0	2·2	5,950
October..	60	40	50	1·0	1·2	3,070

NOTE.—The difference between the discharge at gauging stations at Field and No. 2 tunnel gives the discharge of the Yoho river. Accuracy, "A" and "B". Freeze-up occurred about November 15, 1912.

LANE CREEK (267).

Lane creek is a small irrigation stream, about 5 to 7 miles in length, rising in the hills near the Tranquille Forest Reserve, and flowing into North Thompson river from the west, about 14 miles north of Kamloops, near the north boundary of township 21-17-6. The creek is about 8 feet wide and 6 inches deep. On June 21, 1911, the discharge was 3·1 c.f.s., and gradually decreased during the summer, being practically dry during the latter part of July and all August. In 1912, the maximum discharge occurred on May 17, and was about 40 c.f.s. *See* miscellaneous measurements on Lane creek.

Nearly all the water in Lane creek is used for irrigation, there being several ditches just above the wagon road near the mouth. Two small individual ditches take part of the water, and the rest flows into the British Columbia Fruitlands canal.

NORTH LILLOOET RIVER (133).

North Lillooet river has its source in the Golden Ears mountain (5,560 feet) at an elevation of 4,000 feet. It joins South Lillooet river two miles from Pitt river, about 20 feet above sea-level. The drainage area is about 20 square miles, and precipitation varies from 70 inches at the mouth to 10 inches at the head-waters. The stream is open all the year round, and the winter conditions are not severe. About 5 miles above the mouth, the North Lillooet is within a few hundred feet of the South Lillooet. West of that point both streams flow through rich bottom lands, are deep and sluggish and at high water often overflow the surrounding lands. Some of these are being dyked and farmed, and are very valuable. The upper part of the watershed is mountainous. A prominent peak, mount Blanchard, known locally as the Golden Ears, rises to an elevation of 5,500 feet. This peak is snowcapped practically all the year round. In the upper part the stream falls very rapidly, and during high water many trees are washed out and carried down into the flats, where they give much trouble by obstructing the channel, causing the river to overflow and sometimes to even change its course.

The station was established by C. G. Cline on October 27, 1911, and gauge readings have been taken continuously ever since. It is located at the bridge on North Lillooet river at Sibley's blacksmith shop, just below a high-water slough from the

South Lillooet, and directly north of Port Haney. The gauge is a standard vertical staff gauge 7½ feet long, nailed to the south side of the planking on the piling of the bridge near the right bank. It is referred to three permanent bench-marks.

Low-water measurements are made by wading, and high-water measurements by cable suspension from the upstream side of the bridge. The banks are 5 feet high and covered with bushes. The bed of the stream is of sand and gravel. The river is apt to overflow in high water, especially if the water from the South river overflows into it, as it might do during a high flood. It would be very difficult to find a section where this would not occur when the South Lillooet is extremely high; and allowance can be made for it if it does happen. When the South Lillooet flood is properly controlled there will be no more danger of trouble from that source.

DISCHARGE MEASUREMENTS of North Lillooet river, five miles from mouth, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity	Gauge height.	Discharge
1911			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 27	Cline and Smith	1,057	16[1]	13	0·87	2·28	11·3
Dec. 19..	K. H. Smith..	1,057	47	163	1·8	1·35	291·0[2]
1912							
Mar. 16	C. G. Cline.	1,016	19	24·6	0·7	2·60	17·3
July 4	"	1,016	32	21·7	0·9	2·70	22·8
Aug. 17	"	1,016	39	41·7	2·2	3·65	96·2[3]
Sept. 10	"	1,016	32	27·0	1·3	2·89	35·1
Nov. 14	"	1,016	42	115·0	1·5	3·91	170·0

[1] Wading measurement.
[2] Bridge measurement.
[3] Different section.

Daily Gauge Height and Discharge of North Lillooet river, five miles from mouth, for 1911.

Day	October.		November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·15	8·5	3·8	141
2			2·1	8	3·3	69
3			2·2	9	3·2	59
4			2·25	10	3·0	42
5			3·3	69	3·6	107
6			2·9	35	4·2	243
7			5·25	610	3·6	107
8			4·2	243	6·4	1,100
9			3·3	69	4·5	335
10			3·3	69	3·9	163
11			3·0	42	4·9	170
12			3·0	12	3·75	132
13			3·0	42	3·5	[illegible]
14			4·1	215	3·2	59
15			3·65	115	3·2	59
16			3·85	152	3·1	81
17			5·95	885	3·3	69
18			[illegible]	1,500	3·1	50
19			[illegible]	470	4·2	243
20			6·0	[illegible]	3·7	125
21			5·05	530	3·3	69
22			3·8	141	4·8	135
23			3·3	69	4·6	365
24			3·1	50	3·6	107
25			5·3	630	3·1	50
26			4·2	243	3·0	12
27			3·4	84	3·1	50
28	2·25	10	3·2	59	3·0	42
29	2·2	9	3·0	42	3·0	12
30	2·2	9	3·7	123	2·9	35
31		9			3·0	12

Monthly Discharge of North Lillooet river, five miles above mouth, for 1911.

(Drainage area, 20 square miles.)

Month.	Discharge in Second-Feet.			Run-Off.		Rainfall.
	Maximum.	Minimum.	Mean.	[illegible]	[illegible]	Feet.
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
The period	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note.—[illegible]

DAILY GAUGE HEIGHT AND DISCHARGE of

Day	January		February		March		April		May		June	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3·0	42	3·3	69	2·7	24	2·8	29	3·5	93	2·9	35
2	3·0	42	3·2	59	2·7	24	2·8	29	3·2	59	2·9	35
3	2·7	24	3·1	50	2·7	24	3·25	64	3·0	42	2·9	35
4	2·7	24	3·1	50	2·6	20	3·2	59	3·0	42	2·8	29
5	2·7	24	3·1	50	2·6	20	3·0	42	3·0	42	2·9	35
6	2·7	24	3·2	59	2·6	20	2·8	29	3·0	42	3·0	42
7	2·7	24	3·2	59	2·6	20	3·25	64	3·1	50	2·9	35
8	2·7	24	4·5	335	2·55	18	3·3	69	3·5	93	2·9	35
9	2·7	24	4·55	350	2·5	17	3·1	50	3·2	59	2·9	35
10	2·8	29	4·1	215	2·5	17	2·9	35	2·9	35	2·8	29
11	2·8	29	4·6	365	2·5	17	3·2	59	2·9	35	2·8	29
12	2·7	24	3·9	163	2·5	17	3·2	59	3·1	50	4·6	365
13	4·0	188	3·5	93	2·5	17	3·0	42	3·2	59	3·8	141
14	4·9	470	4·7	400	2·5	17	2·9	35	3·5	93	3·6	107
15	4·8	435	4·7	400	2·7	24	2·9	35	3·2	59	3·5	93
16	4·5	335	5·3	630	2·7	24	2·8	29	2·9	35	3·2	59
17	3·6	107	4·5	335	2·7	24	2·8	29	2·8	29	3·1	50
18	3·3	69	4·2	243	2·7	24	3·1	50	2·8	29	3·0	42
19	3·2	59	3·6	107	2·6	20	3·0	42	2·8	29	3·0	42
20	3·2	59	3·3	69	2·6	20	2·9	35	3·4	81	3·0	42
21	4·4	303	3·1	50	2·6	20	2·8	29	3·6	107	3·85	152
22	3·9	163	3·1	50	2·6	20	2·8	29	3·5	93	3·2	59
23	3·6	107	3·1	50	2·5	17	2·8	29	3·5	93	3·1	50
24	4·2	243	3·0	42	2·5	17	2·9	35	3·3	69	2·9	35
25	5·7	790	2·9	35	2·6	20	2·9	35	3·2	59	2·9	35
26	3·4	81	2·9	35	2·7	24	2·9	35	3·4	81	2·9	35
27	3·7	123	2·9	35	2·9	35	2·8	29	3·4	81	2·9	35
28	4·7	400	2·9	35	2·9	35	3·6	107	3·4	81	2·8	29
29	4·7	400	2·8	29	2·9	35	3·7	123	3·2	59	2·7	24
30	5·1	550			2·8	29	3·8	141	3·0	42	2·7	24
31	3·7	123			2·7	24			2·8	29		

North Lillooet river, five miles from mouth, for 1912.

July		August		September		October		November		December		Day.
Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	
Feet	Sec. ft	Feet	Sec. ft	Feet.	Sec.-ft	Feet.	Sec. ft.	Feet.	Sec.-ft.	Feet.	Sec. ft.	
2·7	24	2·5	17	4·4	303	2·8	29	2·9	35	[illegible]	[illegible]	1
3·1	50	2·5	17	4·7	390	3·1	50	2·8	29	4·2	243	2
2·8	29	2·5	17	3·7	123	2·8	29	3·0	42	6·5	1,150	3
2·7	24	2·5	17	3·4	81	3·0	42	3·0	42	4·1	217	4
3·25	64	2·5	17	3·1	50	2·8	29	3·8	144	3·5	93	5
3·3	69	2·4	14	2·9	35	2·7	24	4·0	188	3·3	69	6
3·1	50	2·4	14	2·9	35	2·6	20	4·5	335	3·0	42	7
3·0	42	2·4	14	3·6	107	3·0	42	4·4	315	3·0	42	8
2·9	35	4·2	243	3·1	50	2·8	29	3·6	107	3·0	42	9
2·8	29	3·6	107	2·9	35	2·7	24	3·4	81	2·9	35	10
2·8	29	3·2	59	2·8	29	2·6	20	4·0	188	2·9	35	11
2·8	29	2·9	35	2·75	26	2·6	20	5·9	865	3·3	69	12
2·8	29	2·7	24	2·7	24	2·5	17	4·0	188	3·4	81	13
2·7	24	2·8	29	2·6	20	2·5	17	3·4	81	3·3	69	14
2·7	24	3·25	64	2·6	20	2·55	18	3·2	59	3·1	50	15
2·7	24	5·5	570	2·6	20	4·7	390	3·1	50	3·3	69	16
2·7	24	3·9	163	2·6	20	4·9	450	3·7	123	3·5	93	17
2·5	17	3·3	69	2·5	17	3·7	123	4·6	365	3·8	144	18
2·5	17	3·1	50	2·5	17	3·0	42	6·3	1,050	3·3	69	19
2·5	17	2·9	35	2·5	17	3·2	59	3·75	132	3·2	59	20
2·5	17	2·8	29	2·45	16	3·2	59	6·85	1,300	3·1	50	21
2·5	17	2·7	24	2·4	14	3·2	59	6·4	1,100	3·0	42	22
3·5	93	2·7	24	2·4	14	3·4	81	4·9	470	3·2	59	23
3·5	93	2·6	20	2·4	14	3·9	163	4·2	243	3·7	123	24
3·1	50	2·6	20	2·3	11	4·0	188	3·7	123	3·2	59	25
2·9	35	2·5	17	2·4	14	3·7	123	3·3	69	3·2	59	26
2·8	29	2·55	18	2·35	12	3·3	69	3·1	50	3·4	81	27
2·7	24	2·5	17	2·35	12	3·1	50	3·0	42	3·5	93	28
2·6	20	2·5	17	2·35	12	3·2	59	2·9	35	3·3	69	29
2·5	17	3·4	81	2·4	14	3·3	69	2·9	35	4·0	188	30
2·5	17	3·3	69			3·0	42			4·2	243	31

MONTHLY DISCHARGE of North Lillooet river, five miles from mouth, for 1912.

(Drainage area, 20 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain Fall
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	550	24	172	8·6	9·9	10,600	
February	630	29	154	7·7	8·3	8,860	
March	35	17	22	1·1	1·3	1,350	
April	141	29	49	2·5	2·8	2,930	
May	107	29	60	3·0	3·5	3,670	
June	365	24	60	3·0	3·3	3,560	
July	93	17	34	1·7	2·0	2,110	
August	570	13	62	3·1	3·6	3,790	
September	400	12	52	2·6	2·9	3,100	
October	470	15	81	4·0	4·6	4,950	
November	1,300	29	226	11·3	12·6	13,400	
December	1,150	35	136	6·8	7·8	8,360	
The year	1,300	12	92	4·6	62·6	66,680	90

NOTE. Accuracy, "A" and "C."

SOUTH LILLOOET RIVER (132).

South Lillooet river rises in Lillooet lakes at an elevation of 370 feet, discharging into Pitt river below Pitt lake at sea-level.

The precipitation in the Lillooet watershed varies from 70 inches per annum at the mouth to 100 inches, or more, at the head-waters. The stream is at present used for logging, but there are water-power possibilities on it.

The Burrard Power Company is at present planning a power development on this stream. A dam is to be constructed on Lillooet lake, and the freshet waters stored. A head of 800 feet is obtained by carrying the water in a flume along the north shore of the South Lillooet, 5¼ miles to a controlling reservoir and thence by 1,500 feet of pipe line to a power-house near the mouth of the South Lillooet. The original plan of development of this company was the diversion of water from the Lillooet lakes over the divide to Kanaka falls, near the Fraser river. The Burnett Lumber Company objected strenuously to the alienation of South Lillooet river water, since the company claimed the right to the use of the natural flow of the stream for logging purposes. From these objections sprang the famous Burrard Power Case through which the Dominion of Canada right of ownership to the water within the Railway Belt of British Columbia was formerly established.

There are extensive flats on both sides of the South Lillooet for 7 miles from the mouth, and part of this land is under cultivation at present. It is often flooded, and much of it must be dyked before it can be used for farming. The land is very fertile and either open or easily cleared. The intermediate part of the watershed is composed of hills and plateaus, a few hundred feet high, with very valuable timber, mainly fir and cedar. Some of this has been cut, and logging operations are being carried on at present. The logs are run down the river during the freshets, but this method is not very satisfactory. The building of the proposed Vancouver-Mission tramline wi probably provide a better means of handling the timber. In the upper part of the watershed there are mountain peaks several thousand feet high, on some of which the snow remains nearly all summer, until washed down by the fall rain.

Near the mouth the stream is deep, sluggish, and is affected by the rise and fall of the tides. Higher up it is swift and comparatively shallow.

The station on the South Lillooet was established on October 26, 1911, by C. G. Cline, and continuous gauge readings have been taken ever since. It is located at the upper highway bridge across the South Lillooet, about 2½ miles from Port Haney and a quarter of a mile south of the Yennedon post office. This is about 7 miles above the mouth of the river and above tidal influence. It is 5 miles above the mouth of the North Lillooet and 7 miles below Lillooet lake.

The gauge is a chain gauge, located near the middle of the bridge on the down stream side, plumber's chain with a plumb-bob, 24·3 feet long over all. There is also a vertical staff gauge 8 feet long attached to the crib work of the bridge. Both gauges are referred to the same datum, and three bench-marks are established. Measurements are made from the bridge, and the stream is confined by the bridge piers and the road way to one channel. The bed of the stream is of sand and gravel, and there is a slight danger of backwater, through logs lodging in the stream.

DISCHARGE MEASUREMENTS of South Lillooet river, near Haney, 1911-12.

Date.	Hydrographer.	Meter No	Width	Area of section.	Mean velocity.	Gauge height	Discharge
1911.			Feet.	Sq. ft.	Ft.per sec.	Feet.	Sec.-ft.
Oct. 26	Cline & Smith	1057	100	113	2·0	1·18	226
Dec. 13	K. H. Smith	1057	100	318	4·3	2·80	1,360
1912.							
July 4	C. G. Cline	1046	115	151	2·4	1·70	361
Aug. 17	"	1046	125	288	3·5	2·70	1,010
Sept. 10	"	1046	115	234	3·3	2·00	767
Nov. 13	"	1046	125	608	8·1	4·60	4,950

Daily Gauge Height and Discharge of South Lillooet river, near Haney, B.C., for 1911.

Day	October Gauge height	October Discharge	November Gauge height	November Discharge	December Gauge height	December Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1			0.9	150	2.3	810
2			0.9	150	2.1	[illegible]
3			1.0	170	2.1	660
4			0.9	150	2.1	660
5			0.9	150	2.2	730
6			1.2	230	2.3	810
7			1.9	530	2.4	[illegible]
8			2.7	1,160	3.7	2,[illegible]
9			2.5	970	4.2	3,[illegible]
10			2.2	730	3.4	2,000
11			2.0	590	3.4	2,000
12			2.0	590	3.0	1,480
13			1.9	530	2.8	[illegible]
14			2.1	660	2.7	1,160
15			2.0	590	2.6	1,060
16			2.5	970	2.5	970
17			3.8	2,630	2.4	890
18			5.2	5,670	2.2	730
19			5.0	5,170	3.0	1,480
20			5.2	5,670	3.0	1,480
21			5.0	5,170	2.8	1,290
22			4.2	3,360	2.8	1,290
23			3.4	2,000	4.0	2,900
24			3.0	1,480	3.4	2,000
25			3.6	2,300	3.1	1,600
26			3.2	1,730	2.8	1,290
27	1.2	230	3.0	1,180	2.3	[illegible]
28	1.1	200	2.6	1,060	2.4	[illegible]
29	1.1	200	2.4	890	2.0	[illegible]
30	1.0	170	2.2	730	1.9	[illegible]
31	1.0	170			1.8	[illegible]

MONTHLY DISCHARGE of South Lillooet river, near Haney, B.C., for 1911.

Month	Discharge in Second-feet			Run-off	Rainfall
	Maximum	Minimum	Mean	Total in acre-feet	Inches
November	5,670	150	1,589	91,600	
December	1,360	470	1,255	77,800	
The period					[illegible]

NOTE.—This station was established on October 26, 1911. The flow during November and December is greater on the South Lillooet river than for any corresponding time of the year.

Accuracy, "B" and "C".

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·5	330	3·3	1,860	1·6	380	1·3	260	2·5	970	2·3	810
2	1·2	230	2·8	1,260	1·5	330	1·4	290	2·3	810	2·1	660
3	1·0	170	2·6	1,060	1·5	330	1·6	380	2·3	810	2·0	590
4	1·2	230	2·4	1,890	1·4	290	1·7	430	2·2	730	1·9	530
5	1·1	200	2·4	890	1·3	260	1·8	470	2·2	730	1·9	530
6	1·0	170	2·1	660	1·3	260	1·8	470	2·2	730	1·9	530
7	1·0	170	2·0	590	1·2	230	1·9	530	2·1	660	2·0	590
8	1·0	170	2·6	1,060	1·1	200	2·0	590	2·1	660	2·0	590
9	1·1	200	3·2	1,730	1·0	170	2·1	660	2·2	730	1·9	530
10	0·9	150	3·5	2,150	1·0	170	2·0	590	2·5	970	1·9	530
11	1·0	170	3·5	2,150	0·9	150	1·9	530	2·4	890	2·0	590
12	1·1	200	3·6	2,390	0·8	130	1·8	470	2·3	810	2·8	1,260
13	1·5	330	3·4	2,000	0·9	150	1·7	430	2·2	730	3·0	1,480
14	3·4	2,000	3·8	2,630	1·0	170	1·6	380	2·3	810	3·2	1,730
15	3·6	2,300	3·7	2,460	1·0	170	1·8	470	2·5	970	3·2	1,730
16	3·8	2,630	3·9	2,810	1·05	185	1·7	430	2·4	890	3·0	1,480
17	3·3	1,860	3·8	2,630	1·1	200	1·7	430	2·3	810	2·8	1,260
18	3·4	2,000	3·6	2,390	1·1	200	1·6	380	2·2	730	2·6	1,060
19	3·2	1,730	3·3	1,860	1·1	200	1·7	430	2·1	660	2·5	970
20	3·0	1,480	2·9	1,370	1·05	185	1·6	380	2·0	590	2·4	890
21	3·1	1,600	2·4	890	1·0	170	1·6	380	2·2	730	2·4	890
22	3·4	2,000	2·4	890	1·0	170	1·5	330	2·4	890	2·3	810
23	3·3	1,860	2·3	810	1·09	150	1·6	380	2·3	810	2·2	730
24	3·5	2,150	2·2	730	1·09	150	1·5	330	2·2	730	2·1	660
25	4·3	3,560	2·1	660	1·09	150	1·5	330	2·1	660	2·0	590
26	4·2	3,360	1·8	470	1·0	170	1·5	330	2·2	730	2·0	590
27	3·4	2,000	1·7	430	1·1	200	1·5	330	2·3	810	1·9	530
28	3·5	2,150	1·7	430	1·2	230	1·8	470	2·5	970	1·8	470
29	3·6	2,300	1·7	430	1·2	230	2·3	810	2·6	1,060	1·8	470
30	4·2	3,360	......	......	1·3	260	2·5	970	2·5	970	1·7	430
31	3·8	2,630	......	......	1·3	260	......	......	2·3	810		

South Lillooet river, near Haney, B.C., for 1912.

July.		August.		September.		October.		November.		December.		Day.
Gauge height	Discharge	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
1·7	430	1·4	290	2·0	590	1·1	200	2·0	590	2·2	730	1
1·7	430	1·3	260	3·3	1,860	1·2	230	2·0	590	2·5	970	2
1·7	430	1·3	260	3·3	1,860	1·4	290	1·9	530	3·5	2,150	3
1·7	430	1·2	230	3·2	1,730	1·3	260	2·0	590	3·2	1,730	4
1·8	470	1·1	200	2·8	1,260	1·3	260	2·5	970	2·9	1,370	5
2·0	590	1·1	200	2·2	730	1·3	260	3·2	1,730	2·6	1,060	6
2·1	660	1·1	200	2·2	730	1·3	230	3·6	2,300	2·4	890	7
2·1	660	1·0	170	2·1	660	1·4	290	3·4	2,000	2·2	730	8
1·9	550	1·6	380	2·1	660	1·4	290	3·0	1,480	2·0	590	9
1·8	470	2·0	590	2·0	590	1·3	260	3·0	1,480	2·0	590	10
1·7	430	2·2	730	1·9	530	1·2	230	2·8	1,260	1·8	470	11
1·6	380	2·2	730	1·8	170	1·2	230	3·0	1,480	2·3	810	12
1·6	380	2·1	660	1·7	450	1·1	200	3·2	1,730	2·6	1,060	13
1·6	380	2·0	590	1·6	380	1·1	200	4·6	1,220	2·9	1,370	14
1·5	330	2·0	590	1·6	380	1·2	230	3·8	2,630	3·0	1,480	15
1·5	330	2·8	1,260	1·5	330	1·8	470	3·3	1,860	2·7	1,160	16
1·4	290	2·8	1,260	1·5	330	3·0	1,480	2·7	1,160	2·6	1,060	17
1·3	260	2·7	1,160	1·4	280	2·8	1,260	3·2	1,730	2·6	1,060	18
1·3	260	2·6	1,060	1·3	260	3·0	1,480	5·0	5,170	2·7	1,160	19
1·3	260	2·2	730	1·2	230	2·9	1,370	5·1	5,420	2·7	1,160	20
1·3	260	2·1	660	1·1	200	2·6	1,060	5·4	6,190	2·6	1,060	21
1·2	230	1·9	530	1·1	200	2·7	1,160	4·8	4,680	2·5	970	22
1·3	260	1·8	470	1·0	170	2·8	1,260	4·4	3,780	2·4	890	23
1·4	290	1·7	430	1·0	170	2·9	1,370	3·8	2,630	2·5	970	24
1·7	430	1·6	380	1·0	170	3·1	1,600	3·6	2,300	2·5	970	25
1·7	430	1·6	380	1·0	170	3·3	1,860	3·0	1,480	2·4	890	26
1·6	380	1·5	330	0·9	150	3·3	1,860	2·7	1,160	2·4	890	27
1·6	380	1·4	290	0·9	150	2·8	1,260	2·4	890	2·5	970	28
1·5	330	1·4	290	0·9	150	2·5	970	2·2	730	2·6	1,060	29
1·5	330	1·5	330	1·0	170	2·3	810	2·0	590	2·7	1,160	30
1·4	290	1·8	470			2·2	730			3·0	1,480	31

Monthly Discharge of Lillooet river, near Haney, B.C., for 1913.

Month.	Discharge in Second-Feet.			Run-off.	Rainfall.
	Maximum.	Minimum.	Mean.	Total in acre-feet.	Inches.
January	3,560	150	1,412	86,800	
February	2,810	430	1,393	80,000	
March	380	130	210	12,900	
April	970	260	455	27,000	
May	1,060	590	802	49,300	
June	1,730	430	817	48,600	
July	660	260	387	23,800	
August	1,260	170	520	32,000	
September	1,860	150	533	31,700	
October	1,860	200	763	46,900	
November	6,190	530	2,111	125,600	
December	2,150	470	1,062	65,200	
The year	6,190	130	872	630,000	70 to 100

Note.—Accuracy, "B" and "C."

Louis Creek (243).

Louis creek has its source in the Niskonlith creek divide, (township 21, R. 14 west 6th meridian) at an elevation of 3,100 feet, and discharges into the North Thompson from the east, 36 miles north of Kamloops, at an elevation of 1,160 feet. It is part of the Thompson drainage; the drainage area, as measured from the Geological survey map, dated 1895, scale 2 miles to an inch, is 180 square miles. Of this area, 160 square miles is above the river station. Louis creek has a small industrial water-power, and is used a little for irrigation purposes near the mouth in the North Thompson valley. The ranches in the Louis creek valley do not require irrigation except in very dry years, as the stream is almost entirely outside the Dry Belt. It is probable that the mean annual precipitation is from 15 to 25 inches. The valley is bounded by high precipitous mountains, heavily timbered, whose snow feeds the creek as well as its tributaries, Fadear, Cahilty, and McGillivary creeks, entering from the east, and Christian creek from the west, near the head-waters. There is a small saw mill at the mouth operated by power from the creek, and similar industrial powers would be possible on the lower 5 miles of the stream, where the stream falls rapidly, in contrast to its sluggishiness in its upper twenty miles. The tributaries of Louis creek also have good power possibilities and, should a market arise, would warrant a thorough investigation.

The river station on Louis creek was established on August 16, 1911, by C. G. Cline. It is located at a bridge on the Leslie ranch, 2 miles south of the Railway Belt boundary, and about 12 miles from the mouth. The purpose of this location was to determine the amount of Louis creek water rising in the Railway Belt. A standard vertical staff gauge, 7 feet long, is located on the right bank 50 feet above the aforementioned bridge, and its datum referred to three bench-marks. The measuring section is at the bridge; in low water, the measurements are made by wading, in high water by means of a cable from the bridge. This is a good section, the control is fair, the current uniform, the banks high, and one permanent channel.

Discharge Measurements of Louis Creek, below Cahilty creek, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 16	C. G. Cline	1046	25	33·4	0·8	0·91	28
Sept. 18	"	1046	26	36·8	0·96	0·98	35·3
1912.							
Apr. 30	Cline & Dann	1046	26	19·4	1·7	1·50	94
May 16	E. M. Dann	1044	30·8	108	4·0	3·80	439
May 29	"	1044	28	90	3·6	3·20	328
June 8	"	1044	28	82·4	3·4	2·72	276
June 9	"	1044	28	85·1	3·4	2·84	288
Aug. 22	H. J. E. Keyes	1057	30	18·7	2·8	1·02	52*

*Different metering section.

Daily Gauge Height and Discharge of Louis creek, below Cahilty creek, for 1911.

Day.	August.		September.		October.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0.75	17	0.85	24
2			0.7	14	0.85	24
3			0.7	14	0.8	20
4			0.85	24	0.8	20
5			0.95	32	0.8	20
6			0.72	29	0.8	20
7			0.9	27	0.8	20
8			0.9	27	0.8	20
9			0.95	32	0.8	20
10			0.95	32	0.75	17
11			0.8	20	0.75	17
12			0.8	20	0.75	17
13			0.85	21	0.75	17
14			1.12	18	0.75	17
15			1.1	16	0.75	17
16	0.9	27	1.07	43	0.75	17
17	0.9	27	1.02	38	0.75	17
18	0.9	27	1.0	36	0.75	17
19	0.85	24	0.95	32	0.75	17
20	0.85	24	0.95	32	0.75	17
21	0.85	24	0.95	32	0.75	17
22	0.85	24	0.9	27	0.75	17
23	0.85	24	0.9	27	0.7	14
24	0.85	24	0.9	27	0.7	14
25	0.85	24	0.9	27	0.7	14
26	0.8	20	0.9	27	0.7	14
27	0.8	20	0.85	21	0.7	14
28	0.75	17	0.85	21	0.75	17
29	0.75	17	0.85	21	0.75	17
30	0.75	17	0.85	21	0.75	17
31	0.75	17			0.75	17

Monthly Discharge of Louis creek below Cahilty creek, for 1911.
(Drainage area, 100 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on drainage area.	Total in acre-feet.	Inches.
September	18	11	28.3	0.28	0.31	1,680	
October	24	11	17.6	0.18	0.21	1,080	
The period							15

Note.—Station established August 16; readings in November and December affected by ice conditions.
Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·65	34	15	94	2·75	270	1·55	100
2	0·7	36	1·5	94	2·62	249	1·65	111
3	0·75	38	1·6	105	2·47	225	1·62	107
4	0·75	38	1·6	105	2·42	218	1·62	107
5	0·7	36	1·7	117	2·37	210	1·82	133
6	0·7	36	[illegible]	126	2·37	210	1·77	126
7	0·7	36	1·87	140	2·47	225	1·77	126
8	0·8	40	2·27	196	2·72	265	1·67	113
9	0·8	40	2·57	241	2·75	270	1·57	102
10	0·85	43	2·45	222	2·6	246	1·5	94
11	0·95	48	2·45	222	2·57	241	1·52	96
12	0·97	49	2·57	241	2·77	273	1·4	84
13	0·92	46	2·77	273	[illegible]	286	1·45	89
14	0·9	45	3·02	313	[illegible]	246	1·37	81
15	0·9	45	3·55	398	2·97	305	1·3	71
16	0·9	45	3·85	446	3·0	310	1·27	71
17	0·9	45	3·72	425	2·65	254	1·25	70
18	0·9	45	3·37	369	2·55	238	1·2	65
19	0·9	45	3·2	342	2·45	222	1·2	65
20	0·9	45	3·37	369	2·32	203	1·15	61
21	0·9	45	3·9	454	2·2	186	1·1	57
22	0·95	48	4·1	485	2·05	165	1·15	95
23	1·0	50	4·27	514	1·87	140	1·65	111
24	1·05	54	4·3	520	1·77	126	1·6	105
25	1·1	57	4·2	500	1·67	113	1·52	96
26	1·1	57	4·12	488	1·6	105	1·42	86
27	1·1	57	4·12	488	1·6	105	1·32	76
28	1·1	57	3·67	417	1·57	102	1·3	74
29	1·15	61	3·27	[illegible]	1·5	94	1·22	67
30	1·25	70	3·05	[illegible]	1·5	94	1·2	65
31	1·5	94	2·85	[illegible]	......	....	1·15	61

Louis creek, below Cahilty creek, for 1912.

August		September.		October.		November.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
1·15	61	1·15	61	0·9	45	0·85	43	1
1·15	61	1·17	63	0·9	45	0·85	43	2
1·1	57	1·32	76	0·9	45	0·85	43	3
1·1	5	1·27	71	0·9	45	0·85	43	4
1·1	57	1·2	65	0·9	45	0·85	43	5
1·05	54	1·2	65	0·9	45	0·85	43	6
1·0	50	1·32	76	0·9	45	0·85	43	7
1·0	50	1·37	81	0·9	45	0·85	43	8
1·17	63	1·3	74	0·9	45	0·85	43	9
1·1	57	1·25	70	0·9	45	0·85	43	10
1·22	67	1·2	65	0·9	45	0·85	43	11
1·15	61	1·17	63	0·9	45	0·85	43	12
1·1	57	1·15	61	0·9	45	0·90	45	13
1·05	54	1·1	57	0·9	45	0·85	43	14
1·1	57	1·07	55	0·9	45	0·85	43	15
1·3	74	1·05	53	0·9	45	0·85	43	16
1·4	84	1·0	50	1·07	55			17
1·3	74	1·0	50	1·05	53			18
1·22	67	1·0	50	1·02	51			19
1·1	57	1·0	50	1·0	50			20
1·1	57	0·95	48	0·95	48			21
1·05	54	0·95	48	0·95	48			22
1·0	50	0·95	48	0·95	48			23
1·0	50	0·95	48	0·95	48			24
1·0	50	0·95	48	0·95	48			25
1·0	50	0·95	48	0·95	48			26
0·95	48	0·95	48	0·95	48			27
1·0	50	0·9	45	0·9	45			28
1·0	50	0·9	45	0·85	48			29
1·0	50	0·9	45	0·85	48			30
1·05	54			0·85	48			31

MONTHLY DISCHARGE of Louis creek, below Cahilty creek, for 1912.

(Drainage area, 100 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on drainage area.	Total in acre-feet.	Inches
April	94	34	47·6	0·48	0·53	2,850	
May	520	94	312	3·1	3·6	19,200	
June	310	94	207	2·07	2·31	12,390	
July	133	57	89·3	0·84	1·0	5,490	
August	84	50	57·5	0·57	0·66	3,540	
September	84	45	57·6	0·58	0·65	3,430	
October	55	43	46·4	0·46	0·53	2,850	
The period							15

NOTE.—Readings taken during January, February and March affected by ice conditions. Accuracy, "B."

MARTIN CREEK (256).

Martin creek is a small irrigation stream rising in the hills on the south side of the Thompson valley, 3 miles southeast of Pritchard. The stream flows in a northwesterly direction, discharging into South Thompson river at an elevation of 1,150 feet, in township 19-14-6.

Martin creek is about 5 miles long, from 5 feet to 10 feet wide, and from 6 inches to 1 foot deep. The drainage area is about 5 square miles. The precipitation varies from 9 inches to 14 inches, of which about 5 inches is snowfall. The summers are hot and dry and the winters are not very severe, (-20° F).

The stream is not contentious. Practically all the water is used by the old Martin Estate.

A gauging station was established on this stream on May 31, 1911, by C. E. Richardson. The gauge is a standard staff, and is located about 40 feet above the Ross (Martin Estate) diversion. Readings were taken during 1911; the station was then abandoned, as the stream is not very important.

DISCHARGE MEASUREMENTS of Martin creek, above Ross' Diversion, 1911.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 31	C. E. Richardson	1048	3·8	2·7	1·9	0·8	5·1
Sept. 3	"	[illegible]	1·4	0·28	2·5	0·32	0·67

Daily Gauge Height and Discharge of Martin creek, above Ross' Diversion, for 1911.

Day.	June Gauge height	June Discharge	July Gauge height	July Discharge	August Gauge height	August Discharge	September Gauge height	September Discharge	October Gauge height	October Discharge	November Gauge height	November Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·8	5·1	0·4	0·5				0	0·4	0·5	0·3	0
2	0·8	5·1	0·4	0·5	0·3	0		0	0·4	0·5	0·3	0
3	0·8	5·1	0·4	0·5	0·3	0		0	0·4	0·5	0·3	0
4	0·75	4·4	0·4	0·5	0·3	0		0	0·4	0·5	0·32	0·1
5	0·65	3·3	0·4	0·5	0·3	0		0	0·4	0·5	0·35	0·2
6	0·65	3·3	0·4	0·5	0·35	0·2		0	0·4	0·5	0·35	0·2
7	0·6	2·5	0·4	0·5	0·35	0·2	0·3	0	0·4	0·5	0·4	0·5
8	0·6	2·5	0·45	1·0	0·3	0	0·3	0	0·4	0·5	0·4	0·5
9	0·6	2·5	0·45	1·0		0	0·35	0·2	0·4	0·5	Frozen	0·5
10	0·6	2·5	0·45	1·0		0	0·35	0·2	0·4	0·5		0·5
11	0·6	2·5	0·45	1·0			0·35	0·2	0·4	0·5		0·2
12	0·55	2·0	0·45	1·0			0·35	0·2	0·4	0·5		0·2
13	0·55	2·0	0·45	1·0			0·4	0·5	0·4	0·5	0·35	0·2
14	0·55	2·0	0·45	1·0			0·4	0·5	0·4	0·5	0·4	0·5
15	0·5	1·4	0·45	1·0			0·4	0·5	0·35	0·2	0·4	0·5
16	0·5	1·4	0·45	1·0			0·4	0·5	0·35	0·2	0·4	0·5
17	0·5	1·4	0·45	1·0			0·4	0·5	0·35	0·2	0·4	0·5
18	0·5	1·4	0·45	1·0			0·4	0·5	0·35	0·2		
19	0·5	1·4	0·45	1·0	No flow		0·4	0·5	0·35	0·2		
20	0·45	1·0	0·45	1·0			0·4	0·5	0·32	0·1		
21	0·45	1·0	0·4	0·5			0·4	0·5	0·32	0·1		
22	0·45	1·0	0·4	0·5			0·4	0·5	0·3			
23	0·45	1·0	0·4	0·5			0·4	0·5	0·3			
24	0·45	1·0	0·4	0·5			0·4	0·5	0·3			
25	0·45	1·0	0·4	0·5			0·4	0·5	0·3			
26	0·45	1·0	0·35	0·2			0·4	0·5	0·3			
27	0·45	1·0	0·35	0·2			0·4	0·5	0·3			
28	0·4	0·5	0·35	0·2			0·4	0·5	0·3			
29	0·4	0·5	0·35	0·2			0·4	0·5	0·3			
30	0·4	0·5	0·30				0·4	0·5	0·3			
31			0·30						0·3			

Monthly Discharge of Martin creek, above Ross' Diversion, for 1911.

Month.	Discharge in Second-Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet.
June	5·1	0·5	2·04	0·41	0·46	121
July	1·0	0	0·64	0·13	0·15	39
August	0·2	0	0·01	0·002	0·002	0·6
September	0·5	0	0·33	0·066	0·07	20
October	0·5	0	0·27	0·05	0·06	17
November	0·5	0	0·30	0·06	0·07	18

Note.—Accuracy "D."

Meadow Creek (257).

Meadow creek has its source in the hills between Kamloops lake and Nicola river, at an elevation of 4,100 feet, and discharges into Guichon creek about 5 miles above Mamit lake, at an elevation of 3,300 feet. It is part of the Guichon-Nicola-Thompson drainage; the drainage area, as measured from a Geological Survey map, dated 1895, scale 2 miles to an inch, is 145 square miles. There are several small unnamed streams discharging into Meadow creek, but the only important tributary is Greenstone creek. Meadow creek is an irrigation stream in the Dry Belt; the summers are hot and dry, the winters long and severe about (-30° F.); the annual precipitation is about 15 inches. Meadow creek is a sluggish stream, about 16 miles long, flowing from Trout lake through flat meadows, which vary from one-quarter to one mile in width; these meadows are often flooded during the summers by beaver dams, causing great annoyance to the ranchers. The last four miles is of greater slope, making the stream very tumultuous near the mouth, especially in high water. On this account it is very difficult to find a suitable location for a gauge in the vicinity.

Meadow creek is the principal tributary of Guichon creek, and hence becomes a very contentious stream. Water could be stored in Trout lake, but its drainage area is so small that it is questionable whether there would be enough water to warrant the expenditure. The same objection applies to Ridge lake (a small lake lying to the southwest of Trout lake). Water could be stored in Face and Big Fish lakes at the head of Greenstone creek, but as the average daily discharge of Greenstone is less than 10 second-feet for the irrigation season, and records are held by the owners of the Watson meadows for more water than actually exists in Greenstone creek, the damming of these lakes would be of interest only to the holders of records on Greenstone creek. (For further information see Greenstone creek.)

The river station on Meadow creek was established June 5, 1911, by W. M. Carlyle. The measuring section is located about 300 yards above the Mamit lake wagon road, just below the gauge. A standard vertical staff gauge is located on the right bank about 400 yards from the mouth. The measuring section is excellent in low water, the control is good, the current uniform, and the bed permanent. In high water, however, the stream is so rapid and tumultuous that measurements are taken at the road, where the stream runs in three channels. The datum of the gauge is referred to three bench-marks.

DISCHARGE MEASUREMENTS of Meadow creek, near mouth, 1911-12.

Date.	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity	Gauge height	Discharge
1911.			Feet.	Sq. ft	Ft per sec	Feet	Sec.-ft
June 5	W. M. Carlyle	1011	18	19·8	2·1	1·78	41·5
June 27	"	1011	*1	6·0	0·3	0·80	1·74
July 19	"	1011	0·7	0·36	1·8	0·58	0·61
Aug 7	"	1011	1·8	0·57	0·43	0·52	0·25
Aug 9	"	1011	13	9·92	0·61	1·00	6·01
Aug 9	"	1011	13	13·0	1·1	1·30	13·9
1912							
April 28	H. J. Keys	1057	21	22·6	1·21	1·50	27·5
May 14	"	1057	16·5	49·2	4·2	3·10	207·5
May 21	"	1057	39·0	36·1	3·9	2·40	141·4
May 31	"	1057	18·0	68·0	1·15	2·00	78·1
June 10	"	1057	17·0	9·5	2·24	1·39	21·3
June 24	"	1057	8·0	6·2	1·68	1·13	10·4
July 2	"	1057	8·5	6·2	1·35	1·10	8·4
July 15	"	1057	11·5	8·3	1·07	1·23	8·96
July 30	"	1057	6·3	4·2	0·87	0·96	3·65
Aug. 16	"	1057	5·8	3·72	0·96	0·92	3·57
Sept. 3	"	1057	6·5	5·4	1·35	1·10	7·3
Sept. 16	"	1057	5·5	3·9	1·0	0·90	3·97

* New Measuring section.

GAUGE HEIGHTS AND DAILY DISCHARGE of Meadow creek, near mouth, for 1911.

Day.	June.		July.		August.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				1·31	0·30	0·06
2			0·72	1·31		0·05
3				1·31		0·04
4			0·72	1·31		0·03
5	1·78	41·6		1·31	0·20	0·02
6		38·5		1·31		0·14
7	1·70	35·0	0·72	1·31	0·52	0·26
8		31·5		1·31	1·05	6·85
9		28·0	0·72	1·31	1·15	9·50
10	1·52	23·5		1·60		6·50
11		20·0		2·00	0·80	2·12
12		16·5	0·80	2·12		1·80
13	1·25	12·4		1·90		1·50
14		11·5		1·40	0·70	1·11
15	1·18	10·3	0·68	0·99		0·80
16		8·5		0·99		0·60
17	1·02	6·12		0·99	0·50	0·20
18		5·2		0·99		0·18
19		4·2	0·68	0·99		0·16
20	0·88	3·30		0·50		0·14
21		2·8	0·52	0·26	0·40	0·12
22	0·82	2·42		0·50		0·10
23		2·5		0·60		0·08
24		2·6	0·65	0·81		0·06
25		2·74		0·60		0·05
26	0·85	2·85		0·40	0·25	0·04
27	0·80	2·12	0·50	0·20		
28		1·90		0·18		
29	0·75	1·62		0·12	Creek dry.	
30		1·40	0·40	0·12		
31				0·08		

MONTHLY DISCHARGE of Meadow creek, near mouth, for 1911.

(Drainage area, 145 square miles.)

Month	Discharge in Second-feet.				Run-off.		Rain-fall
	Maximum	Minimum	Mean	Per sq. mile	Depth in inches on Drainage area	Total in acre-feet	Inches
June	41·6	4·4	11·0	0·1	0·1	833	
July	2·42	0·08	0·97	0·01	0·01	60	
August	9·5	0·32	1·25	0·01	0·01	77	
The period							

NOTE.—Station maintained only during the irrigation season.
Accuracy "B."

GAUGE HEIGHTS AND DAILY DISCHARGE of Meadow creek near mouth, for 1912.

Day	April		May		June		July		August		September	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		3·0		49·5		70·0		6·4		3·2	1·0	4·4
2	1·0	4·1	1·8	55·0	1·85	60·5		8·2	0·9	2·8		5·2
3		7·3		60·5		55·0	1·2	10·4		2·5		6·0
4	1·2	10·1	1·9	66		49·5		9·3	0·85	2·3	1·1	6·8
5		7·9		78	1·7	41	1·15	8·1		2·3		5·6
6	1·07	5·6	2·1	94		39·5		11·6		2·3	1·0	4·4
7		11·6		118	1·6	35	1·3	14·8	0·85	2·3		4·6
8		17·6	2·5	146		26·2		13·2		2·1	1·12	4·9
9	1·45	23·5		183	1·35	17·4		11·6	0·8	2·0		5·5
10		23·5	3·0	220		16·8	1·2	10·1		2·0		6·1
11		23·5		210		16·2		10·1	0·8	2·0	1·1	6·8
12	1·45	23·5		209		15·5	1·2	10·1		2·3		5·6
13		24·7	2·8	250	1·3	14·8		10·1		2·6	1·0	4·4
14		25·9	3·1	235		14·8	1·2	10·1	0·9	2·8		4·0
15	1·5	27·0	3·0	220	1·3	14·8		9·3		2·8	1·0	4·4
16		23·0		220		16·1		8·5	0·9	2·8		
17		18·9	3·0	220	1·35	17·4		7·7		4·2		
18	1·3	14·8		280		16·6	1·1	6·8	1·05	5·6		
19		11·8	2·7	175	1·32	15·8		5·6		6·8		
20	1·3	11·8		165		15·3	1·0	4·1		8·0		
21		12·3		155	1·3	14·8	1·2	10·1	1·17	9·1		
22	1·2	10·1	2·5	146		13·6		9·5		20·0		
23		15·0		142	1·25	12·4		8·9	1·55	31·0		
24	1·4	20·0	2·45	139		10·4	1·15	8·4		49·7		
25		22·5		135		7·8		7·6	1·15	8·4		
26		24·6	2·4	132	1·05	5·6	1·1	6·8		7·1		
27	1·5	27·0		123		4·6		6·2		5·8		
28		32·7		114	0·95	3·6	1·05	5·6	1·0	4·4		
29		38·1	2·2	104		4·0		4·9		3·3		
30	1·7	44·0		91	1·0	4·4		4·2	0·85	2·3		
31			2·0	78			0·95	3·6		3·3		

MONTHLY DISCHARGE of Meadow Creek, near mouth, for 1912.

(Drainage area, 145 square miles.)

Month	Discharge in Second-Feet				Run-Off		Rainfall
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on drainage area.	Total in acre-feet	Inches.
April	41.0	3.0	19.4	0.13	0.145	1,136	
May	255.0	44.5	111.0	[illegible]	1.15	8,850	
June	70.0	7.6	21.7	0.15	0.17	1,290	
July	14.8	3.6	8.4	0.06	0.07	516	
August	31.0	2.0	5.7	0.04	0.05	350	
The period							15

NOTE.—Station maintained only during the irrigation season. Accuracy, A.

MESLILOET RIVER (1031).

Mesliloet river (or Indian river) has its source in the mountains north of the Railway Belt boundary, at an elevation of between two and three thousand feet, and discharges into the north arm of Burrard inlet at sea-level. The drainage area, as measured from a provincial map, scale 10 miles to 3·05 inches, is 75 square miles. The hills in which the Mesliloet rises are quite close to the coast, and receive a heavy precipitation. In the winter a heavy snowfall is apt to be followed by a thaw or a rain, which causes great fluctuations in the flow of the stream, especially as there is no lake on the main stream to act as a regulator. The hills are in the main, steep and rocky; this also tends to give a rapid run-off.

There is a considerable amount of good timber in this watershed, principally fir and cedar; cedar shingle bolts are being cut at present, and floated down stream to salt water; this stream, however, is not suitable for running logs and a logging railroad will have to be built to get out the fir. A company proposes to build a saw-mill on the North Arm at the mouth of the Mesliloet, and have driven piles for the booming grounds; this company is also investigating the power possibilities of the stream and its tributaries, Hixon and Brandt creeks. The Mesliloet proper has a fall of 350 feet in 2½ miles; while Brandt and Hixon have falls of 1,800 and 2,000 feet in 2 and 2½ miles respectively. There are good gravel deposits at the mouth of the river, and two dredges are at present dredging gravel for use in the city of Vancouver. The Indian River Park Company has built a summer hotel (Wigwam Inn) and park near the mouth of the river, and their steamer makes two trips a day to Vancouver during the season. There is little agricultural land in the watershed, and none is worked; the only inhabitants, except those at the mouth, being a few lumbermen in a camp 5 miles up stream. About 8 miles up there is a canyon, with rapids; for the most part the stream is rapid, with frequent riffles. Salmon run up the Mesliloet for several miles, and a good catch is made every year by the Indians.

The river station on the Mesliloet river was established March 14, 1912, by C. G. Cline. The measuring section is located 1 mile up stream above the influence of the tide, which comes up a little more than one-half a mile. A chain gauge of No. 14 sash chain, suspending a 14-pound sash weight, is located on the left bank, 100 feet below the measuring section. The datum of the gauge is referred to three bench-marks. The measurements are made from a canoe, fastened to a cable suspended across the stream, either by a meter rod or by a meter on a cable; in low water, wading measurements are made one-quarter of a mile above the gauge. This is an excellent measuring section; there is good control, high banks, swift, uniform current, one channel with a permanent bed; there is, however, a possible chance of backwater for an hour or so during high tide.

There are six other stations in this watershed; these have only recently been established and no discharge data have yet been compiled: Mesiliot river (upper station) (104), Hixon creek (105), Belknap creek (106), Brandt creek (107), Norton creek (108), Young creek (109).

The Westminster Power Company, having made application for water power privileges on the Mesliloet, and its tributaries, Brandt, Young, Norton, Hixon, and Belknap creeks, with storage rights on Young, Norton, and Belknap lakes, C. G. Cline of the Dominion Hydrographic Survey established stations on the above streams during October, 1912, and frequent readings have been taken subsequently. Some miscellaneous measurements on above creeks.

Mesliloet river (upper station) (104).—This station was established October by C. G. Cline; the measuring section is located about 2 miles above the mouth of Brandt creek, and about one-half a mile below the proposed dam site. A vertical staff gauge was driven into the bed of the stream on the right bank at the measuring section and securely braced; measurements are made by wading. The company have applied for 300 second feet from the Mesliloet.

Hixon creek (105).—The station on Hixon creek was established October. The measuring section is located 200 yards from the mouth; all measurements made by wading; there is a vertical staff gauge, but a small flow leaves the channel above it. The company have applied for 70 second-feet from this creek.

Belknap creek (106).—The station on Belknap creek was established October. The measuring section is located at Belknap lake, just below the outlet, and 3 miles from the Mesliloet; measurements are made by wading. A vertical staff gauge is located on the left bank at the measuring section. The company proposes to store water in Belknap lake, which has a capacity of about 2,000 acre feet.

Brandt creek (107).—The station on Brandt creek was established October 1912. The measuring section and gauge are located about 200 feet from the mouth, above backwaters from the Mesliloet. A vertical staff gauge is located on the bank. Wading measurements are made. The company have applied for 10 cubic feet from this creek.

Norton creek (108).—The station on Norton creek, a tributary of Brandt creek, was established October 20, 1912. The measuring section is located 200 feet below the outlet of Norton lake, 2,500 feet above the Mesliloet, and two miles from Hastings camp. A vertical staff gauge is driven into the bed of the creek at the outlet of the lake. Measurements are made by wading. The company have applied for 30 second-feet from Norton creek; they also propose to store 10,000 acre-feet in Norton lake.

Young creek (109).—The station on Young creek, a tributary of Brandt creek, was established October 20, 1912. The measuring section is located near the mouth and below the falls. A vertical staff gauge is located 150 feet above the measuring section. Measurements are made by wading. The banks are high and rocky, and there is only one channel, with a permanent bed. The company have applied for 30 second-feet from Young creek, and also propose to store water in Young lake, a reservoir of 500 acre-feet capacity.

DISCHARGE MEASUREMENTS of Mesliloet River, at mouth, 1912.

Date		Hydrographer	Meter No.	Width	Area of section	Mean velocity	Gauge height.	Discharge
				Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Mar.	13	C. G. Cline	1046	72	62.4	1.7	1.82	108
July	10	"	1046	80	154	1.9	2.35	291
Aug.	21	"	1046	70	78.5	1.4	2.25	261
Oct.	17	"	1046	110	392	2.8	3.65	1000
Oct.	18	"	1046	118	250	1.8	2.90	615

DAILY GAUGE HEIGHT AND DAILY DISCHARGE

Day	March		April		May		June		July	
	Gauge height	Disch'ge	Gauge height	Disch'ge.	Gauge height	Disch'ge	Gauge height	Disch'ge	Gauge height	Disch'ge
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.
1				160	2·6	414		868		420
2				160		382		854	2·7	466
3			2·0	160		350	3·3	840		485
4				170	2·4	318		807		504
5				180		420		774	2·8	522
6			2·1	194		520		740		504
7				207		620	3·1	706		487
8				220		720		706	2·7	466
9				253		820		706		449
10				246		920	3·1	706		432
11				259		1,020		872	2·6	414
12			2·3	274	3·7	1,130		1,038		366
13	1·82	112		274		1,155	3·8	1,205		320
14		110		274		1,180		1,097	2·3	274
15		108		274		1,200		989		264
16	1·8	107	2·3	274		1,220		880		254
17		107		285		1,240	3·2	772		[illegible]
18		107		296		1,255		795	2·2	[illegible]
19		107		307		1,270		818		232
20	1·8	107	2·4	318	3·9	1·280	3	840		232
21		111		307		1,240		776		232
22		115		296		1,200		712	2·2	232
23	1·85	119		285		1,160		648		246
24		122	2·3	271		1,120		584		260
25		125		290		1,080	2·8	522	2·3	274
26		128		304		1,040		490		274
27	1·9	131	2·1	318		1,000		458		274
28		140		342		955		426	2·3	274
29		150		366	3·4	910		394		260
30	2·0	160		390		896	2·5	361		246
31		160				882			2·2	232

of Mesliloet (Indian) River, at mouth, for 1912.

August.		September.		October.		November.		December.		Day.
Gauge height.	Disch'ge	Gauge height.	Disch'ge	Gauge height.	Disch'ge	Gauge height.	Disch'ge	Gauge height.	Disch'ge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec. ft.	Feet.	Sec.-ft.	
	232		870		609	3·2	772	2·7	466	1
	232		855	3·1	706	3·2	772	2·7	466	2
2·2	232	3·3	840		664	3·0	642	3·0	612	3
	216		890		622	3·5	980	3·2	772	4
	260		940	2·9	580	3·9	1,280	2·8	522	5
2·3	274	3·5	980		600	3·6	1,055	2·9	580	6
	535		940		621	3·8	1,205	2·7	466	7
	795		900	3·0	642	3·8	1,205	2·6	414	8
3·6	1,055		860		602	4·1	1,425	2·6	414	9
	860		820		562	3·7	1,130	2·5	364	10
	665		780	2·8	522	4·0	1,350	2·8	522	11
2·7	466		710		552	3·8	1,205	3·5	980	12
	715	3·1	706		582	3·5	980	3·7	1,130	13
	960		616		612	3·8	1,205	3·8	1,205	14
3·8	1,205		586	3·0	642	4·8	2,000	3·2	772	15
	1,080		526		625	4·2	1,500	3·0	642	16
	955	2·7	466		610	3·7	1,130	2·9	580	17
	830		432		595	4·0	1,350	3·3	840	18
	705		348	2·9	580	5·4	2,400			19
2·9	580	2·5	364		628	4·1	1,425			20
2·25	253		361		676	4·4	1,650			21
	331		364		724	4·3	1,575			22
	409		361	3·2	772	3·9	1,280			23
	487		361		1,020	3·5	980			24
	565	2·5	361		1,260	3·2	840			25
3·0	642		348	4·2	1,500	3·3	840			26
	709		333		1,350	3·0	642			27
	776	2·4	318		1,200	2·8	522			28
	813		415	3·6	1,055	3·7	466			29
3·4	910		512		1,130	2·6	414			30
	890			3·8	1,205					31

MONTHLY DISCHARGE of Mesliloet River, at mouth, for 1912.

(Drainage area, 75 square miles.)

Month.	DISCHARGE IN SECOND FEET.				RUN OFF.		RAIN-FALL.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
March..	160	107	125	1·7	2·11	7,700	
April.	390	160	265	3·5	3·9	15,800	
May..	1,280	318	933	12·4	11·3	57,400	
June. .	1,205	364	746	10·0	11·2	41,100	
July.	522	232	334	4·4	5·1	20,500	
August	1,205	232	635	8·5	9·8	39,200	
September	980	318	609	8·1	9·0	36,200	
October.	1,500	522	776	10·3	11·9	47,700	
November	2,400	411	1,140	15·2	17·0	67,800	
December.	1,205	364	651	8·7	10·0	40,200	
The period					..		1·50

NOTE.—Accuracy, "A" and "C".

MONTE CREEK.

Monte creek is a stream about 20 miles long rising in Monte hills, 5 miles west of Grand Prairie at an elevation of 4,000 feet, and, flowing northerly, discharges into the South Thompson river at Ducks, B.C. It is a stream about 6 feet wide and from 1 foot to 2 feet deep, with a mean velocity of from 0·5 to 4 feet per second. This stream flows through an agricultural district in the Dry Belt, and is a very conten tious irrigation stream. Senator Bostock, a large landowner in the vicinity, irrigates hundreds of acres of land in the Monte Creek valley and also bench and bottom lands in the Thompson river valley near the mouth of the creek. Records on this creek ar held to divert water from the Monte creek, at a point about 15 miles from the mouth, into Summit lake where it is stored and used, when required, on lands near Gran Prairie in the Salmon River drainage. In 1912 there was plenty of water for all con cerned, but in previous years considerable trouble arose due to a scarcity of wate There is a small storage reservoir near the source of Monte creek, with a capacity 2,000 acre-feet.

The precipitation is about 12 inches throughout the valley, of which about inches is snow. The winters are short and cold and the summers hot and dry. Th creek freezes up during the months of December, January and February.

Regular gauging stations were established on Monte creek: (1) Above Bostock diversion (252). (2) Below diversion to Summit lake (253). (3) Diversion Summit lake (254).

(1) *Above Bostock's Diversion* (252).—The station on Monte creek abo Bostock's diversion was established on May 20, 1911, by C. E. Richardson. Th measuring section is located 300 yards above the Bostock headgate, 1½ miles fro Ducks and 100 yards from the wagon road, Ducks to Grand Prairie. The gauge is standard vertical staff near the measuring section on the right bank of the strea Measurements were made by wading with Price's electric current meter. The chan above and below the station is straight for 50 feet, the water is fairly fast. The ri bank is steep for 15 feet to the wagon road. The left bank is low and heavily tr

Gauge on Monte Creek, near Ducks, B. C.

Making Current Meter Measurement by Wading.

bered, but there is no chance of overflow. The bed of the stream is silt at the measuring section and gravel at the gauge. There is only one channel, and its depth is from 1 foot to 3 feet. Three bench-marks were established and referred to the gauge datum.

DISCHARGE MEASUREMENTS of Monte Creek, above Bostock's Diversion, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 20	C. E. Richardson.	1,048	15	16·7	1·4	1·45	23·1
May 20	C. G. Cline	1,044	15	19·4	1·2	1·45	21·2
June 28	C. E. Richardson.	1·048	8·5	6·9	0·62	0·86	3·68
Aug. 8	"	1 048	6·0	2·4	0·42	0·60	1·00
1912.							
May 8	C. E. Richardson	1,048	15	26·8	1·2	1·50	32·9
" 9	"	1,048	16	31·2	1·3	1·57	39·6
" 15	"	1,018	18	39·4	2·2	2·05	88·8
July 15	"	1,048	8·5	6·7	0·8	1·05	5·3

DAILY GAUGE HEIGHT AND DISCHARGE of Monte Creek, above Bostock's Diversion, for 1911.

Day.	May.		June.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·05	6·1
2			1·0	5·0
3			1·0	5·0
4			0·97	4·6
5			0·97	4·6
6			0·97	4·6
7			0·95	4·3
8			0·95	4·3
9			0·92	3·9
10			0·9	3·6
11			0·9	3·6
12			0·9	3·6
13			0·88	3·4
14			0·90	3·6
15			0·82	2·7
16				2·8
17				2·8
18				2·8
19				2·9
20	1·45	26·0		2·9
21	1·4	22·0		2·9
22	1·42	23·6		3·0
23	1·37	20·0		3·0
24	1·37	20·0		3·0
25	1·35	18·6		3·0
26	1·30	15·3		3·0
27	1·25	12·9		3·1
28	1·22	11·5	0·86	3·2
29	1·2	10·5		3·2
30	1·15	8·8		3·2
31	1·1	7·2		

MONTHLY DISCHARGE of Monte Creek, above Bostock's Diversion, for 1911.

(Drainage area, 110 square miles.)

Month.	Discharge in Second Feet.				Run Off		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
June	6·1	2·7	3·6	·03	·03	214	
The period.							9

NOTE. Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of Monte Creek, above Bostock's Diversion for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·39	21·3	1·68	47·0	1·20	10·5		3·4		
2			1·40	22·0		42·0	1·25	12·9		3·3		
3			1·40	22·0	1·58	37·2	1·28	14·3		3·3		
4			1·40	22·0	1·50	30·0	1·25	12·9		3·3	0·86	3·2
5			1·40	22·0	1·48	28·1	1·28	11·3		3·2		
6			1·45	26·0	1·43	23·6	1·28	11·3		3·2		
7			1·50	30·0	1·38	20·7		12·1		3·1	0·88	3·4
8	1·12	7·9	1·51	30·9	1·38	20·7	1·20	10·5		3·1		
9		8·4	1·58	37·2		17·5	1·18	9·8		3·1		
10	1·15	8·8	1·85	65·5	1·28	14·3	1·18	9·8		3·0		
11	1·22	11·5	2·00	83·0		18·1	1·08	6·7		3·0		
12		13·1	2·02	85·4	1·40	22·0	1·10	7·2		3·0		
13	1·30	15·3	2·02	85·4	1·45	26·0	1·08	6·8		2·9		
14		12·5		90·6		28·0		6·3		2·9		
15	1·18	9·8		95·8	1·50	30·0	1·05	6·1		2·8		
16		9·3	2·15	101·0	1·50	30·0	0·98	1·7		2·8		
17	1·15	8·8	2·25	113·5	1·55	31·5	0·98	4·7		2·7		
18		7·1	2·28	117·4	1·58	37·2	0·98	4·7		2·7		
19	1·02	5·4		111·0	1·50	30·0	0·92	3·9		2·6		
20		7·1	2·18	101·6	1·38	20·7	0·95	4·3		2·6		
21		8·8	2·05	89·0		13·9	0·98	1·7	0·80	2·5		
22	1·20	10·5	2·05	89·0	1·10	7·2	0·98	4·7		2·4		
23	1·20	10·5	2·15	101·0		14·2	0·98	4·7		2·3		
24	1·22	11·5		92·0	1·30	15·3	1·25	12·9	0·76	2·2		
25	1·22	11·5	2·00	83·0		14·1	0·95	4·3		2·2		
26	1·28	11·3	2·02	85·4	1·25	12·9	0·95	4·3		2·2		
27	1·28	14·3	1·95	77·0	1·28	11·3	0·95	4·3		2·3		
28	1·22	11·5		68·5	1·25	12·9		3·9	0·78	2·3		
29	1·30	15·3	1·80	60·0	1·25	12·9	0·90	3·6		2·4		
30	1·38	20·7	1·78	57·8		11·7	0·88	3·4		2·6		
31			1·78	57·8				3·1	0·82	2·7		

MONTHLY DISCHARGE of Monte Creek, above Bostock's Diversion, for 1912.

(Drainage area, 110 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	20·7	5·4	10·0	·09	·10	595	
May	117·4	21·3	69·3	·63	·73	4,260	
June	47·0	7·2	22·8	·21	·23	1,360	
July	11·3	3·4	7·5	·07	·08	460	
August	3·1	2·2	2·8	·02	·02	172	
The period							12

NOTE.—Station was maintained during the summer only. The winter conditions are severe, and the creek is frozen for fully four months, during which time the run-off is very small and of little importance for storage.

Accuracy, "A" and "B."

(2) *Monte creek below diversion to Summit Lake* (253).—The station on Monte creek below the diversion to Summit lake was established on May 25, 1911, by C. E. Richardson. The measuring section is 100 yards below the diversion, near T. Graham's, and half a mile west of the Grande Prairie, Monte Creek wagon road, six miles from Grand Prairie. The gauge is a vertical staff 4 inches by 1½ inches by 4·7 feet (cedar), marked in feet and tenths from 3 feet to 7·7 feet, fastened to the right bank of the stream 100 yards below the diversion. Measurements are made with a Price electric current meter and wading equipment. The channel above and below the station is straight for 100 feet, and the water flows with a uniform velocity. The banks are steep and high and sparsely timbered. The bed of the stream is gravelly; there is only one channel, with a depth of from 6 inches to 2·5 feet. Three benchmarks were established and referred to the gauge datum.

DISCHARGE MEASUREMENTS of Monte Creek, below Summit Lake Diversion, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft
May 25	C. E. Richardson	1048	14	13·2	0·7	4·30	9·15
June 15	W. M. Carlyle	1011	13	9·6	0·5	4·08	4·70
July 10	"	1011	14	12·8	0·7	4·20	9·12
July 24	"	1041	13	7·45	0·3	4·00	2·36
Aug. 18	"	1041	3·5	1·35	0·5	3·80	0·63
1912.							
May 11	C. E. Richardson	1048	15	24·7	3·0	4·70	73
July 15.	"	1048	12	9·1	0·5	4·00	4·8
July 17	"	1048	11	7·3	0·4	3·93	2·9
Aug. 27	"	1048	10	4·3	0·4	3·74	1·6

DAILY GAUGE HEIGHT AND DISCHARGE of Monte Creek, below Summit Lake Diversion, for 1911.

Day	May. Gauge height	May. Discharge	June. Gauge height	June. Discharge	July. Gauge height	July. Discharge	August. Gauge height	August. Discharge	September. Gauge height	September. Discharge	October. Gauge height	October. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			4·27	13·4	4·05	3·7	3·95	2·0	3·80	0·4	3·85	0·8
2			4·25	11·8	4·05	3·7	3·92	1·6	3·80	0·4	3·85	0·8
3			4·22	10·4	4·05	3·7	3·90	1·3	3·85	0·8		
4			4·22	10·4	4·05	3·7	3·90	1·3	3·85	0·8		
5			4·20	9·4	4·05	3·7	3·90	1·3	3·85	0·8		
6			4·20	9·4	4·05	3·7	3·95	2·0	3·85	0·8		
7			4·17	8·0	4·10	5·0	4·00	2·7	3·85	0·8		
8			4·15	6·9	4·12	5·9	4·00	2·7	3·80	0·4		
9			4·12	5·9	4·15	6·9	3·97	2·3	3·80	0·4		
10			4·10	5·0	4·20	9·4	3·95	2·0	3·80	0·4		
11			4·10	5·0	4·20	9·4	3·92	1·6	3·80	0·4		
12			4·10	5·0	4·15	6·9	3·90	1·3	3·80	0·4		
13			4·07	4·3	4·12	5·9	3·90	1·3	3·80	0·4		
14			4·07	4·3	4·10	5·0	3·87	1·1	3·80	0·4		
15			4·07	4·3	4·10	5·0	3·87	1·1	3·80	0·4		
16			4·17	8·0	4·05	3·7	3·87	1·1	3·80	0·4		
17			4·12	5·9	4·05	3·7	3·80	0·4	3·85	0·8		
18			4·15	6·9	4·05	3·7	3·80	0·4	3·85	0·8		
19			4·15	6·9	4·05	3·7	3·80	0·4	3·80	0·4		
20			4·12	5·9	4·05	3·7	3·85	0·8	3·80	0·4		
21			4·12	5·9	4·07	4·3	3·85	0·8	3·80	0·4		
22			4·10	5·0	4·05	3·7	3·85	0·8	3·80	0·4		
23			4·10	5·0	4·00	2·7	3·85	0·8	3·80	0·4		
24			4·07	4·3	4·00	2·7	3·80	0·4	3·85	0·8		
25	4·15	6·9	4·05	3·7	4·00	2·7	3·80	0·4	3·85	0·8		
26	4·12	5·9	4·05	3·7	3·97	2·3	3·80	0·4	3·85	0·8		
27	4·15	6·9	4·05	3·7	3·97	2·3	3·80	0·4	3·82	0·6		
28	4·17	8·0	4·05	3·7	3·97	2·3	3·80	0·4	3·82	0·6		
29	4·20	9·4	4·05	3·7	3·95	2·0	3·80	0·4	3·82	0·6		
30	4·22	10·4	4·05	3·7	3·95	2·0	3·80	0·4	3·85	0·8		
31	4·30	15·1			3·95	2·0	3·80	0·4				

MONTHLY DISCHARGE of Monte Creek, below Summit Lake Diversion, for 1911.
(Drainage area, 45 square miles.)

Month	Discharge in Second-Feet. Maximum	Minimum	Mean.	Per sq. mile	Run Off. Depth in inches on Drainage area.	Total in acre-feet.	Rain-fall. Inches
June	13·4	3·7	6·2	·14	·16	369	
July	9·4	2·0	4·4	·09	·10	252	
August	2·7	0·4	1·1	·02	·02	68	
September	0·8	0·4	0·6	·01	·01	36	
The period							9

NOTE.—These figures do not represent the true run-off of the drainage area of Monte Creek above this station, since a large proportion of its natural flow is diverted to Summit lake. The freshet flow of Monte Creek for 1911 occurred before the establishment of this station. The run-off during May, 1911 probably was 1,500 to 3,000 acre-feet.

Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Monte creek, below Diversion to Summit lake, for 1912.

Day.	April. Gauge height	April. Discharge	May. Gauge height	May. Discharge	June. Gauge height	June. Discharge	July. Gauge height	July. Discharge	August. Gauge height	August. Discharge	September. Gauge height	September. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		3·0	4·35	25·0	4·1	7·7	4·0	4·7	4·0	4·7	3·8	2·0
2		3·0	4·35	25·0	4·1	7·7	4·1	7·7	3·9	3·1	3·85	2·5
3		3·0	4·4	30·0	4·05	6·2	4·1	7·7	3·8	2·0	3·8	2·0
4		3·0	4·4	30·0	4·05	6·2	4·0	4·7	3·8	2·0	3·7	1·3
5	3·9	3·1	4·5	43·0	4·05	6·2	4·0	4·7	3·8	2·0	3·7	1·3
6	4·0	4·7	4·5	43·0	4·0	4·7	4·05	6·2	3·8	2·0	3·7	1·3
7	4·1	7·7	4·5	43·0	4·0	4·7	4·05	6·2	3·8	2·0	3·7	1·3
8	4·2	12·1	4·9	110	4·0	4·7	4·10	7·7	3·8	2·0	3·7	1·3
9	4·3	20·0	4·9	110	4·0	4·7	4·05	6·2	3·8	2·0	3·7	1·3
10	4·35	25·0	4·8	92	4·2	12·4	4·05	6·2	3·8	2·0	3·65	1·2
11	4·4	30·0	4·9	110	4·2	12·4	4·08	7·1	3·8	2·0	3·65	1·2
12	4·5	43·0	4·9	110	4·2	12·4	4·1	7·7	3·7	1·3	3·62	1·1
13	4·6	57·0	5·0	130	4·2	12·4	4·1	7·7	3·7	1·3	3·62	1·1
14	4·0	4·7	5·0	130	4·2	12·4	4·1	7·7	3·7	1·3	3·6	1·0
15	4·1	7·7	5·0	130	4·2	12·4	4·1	7·7	3·8	2·0	3·6	1·0
16	4·1	7·7	5·0	130	4·1	7·7	4·0	4·7	3·8	2·0	3·6	1·0
17	4·1	7·7	5·0	130	4·1	7·7	4·0	4·7	3·9	3·1	3·6	1·0
18	4·1	7·7	5·0	130	4·1	7·7	3·95	3·9	3·9	3·1		
19	4·2	12·4	4·6	57	4·1	7·7	4·0	4·7	3·85	2·5		
20	4·2	12·4	4·6	57	4·0	4·7	4·05	16·2	3·8	2·0		
21	4·15	10·0	4·6	57	4·0	4·7	3·9	3·1	3·8	2·0		
22	4·2	12·4	4·6	57	4·0	4·7	3·9	3·1	3·7	1·3		
23	4·2	12·4	4·5	43	4·1	7·7	3·9	3·1	3·7	1·3		
24	4·2	12·4	4·5	43	4·1	7·7	3·9	3·1	3·8	2·0		
25	4·22	13·9	4·5	43	4·1	7·7	3·95	3·9	3·8	2·0		
26	4·2	12·4	4·5	43	4·0	4·7	4·0	4·7	3·7	1·3		
27	4·25	16·2	4·45	36·5	4·0	4·7	4·0	4·7	3·7	1·3		
28	4·3	20·0	4·4	30	4·0	4·7	3·95	3·9	3·7	1·3		
29	4·3	20·0	4·4	30	4·0	4·7	3·9	3·1	3·7	1·3		
30	4·35	25·0	4·4	30	4·0	4·7	3·9	3·1	3·7	1·3		
31			4·35	25			3·9	3·1	3·7	1·3		

MONTHLY DISCHARGE of Monte creek, below diversion to Summit lake, for 1912.
(Drainage area, 45 square miles.)

Month.	Discharge in Second-Feet. Maximum	Minimum	Mean.	Per sq. mile.	Run Off. Depth in inches on Drainage area	Total in acre-feet.	Rain fall. Inches
April	57	30	11·3	·31	·35	851	
May	130	25	67·8	1·51	1·74	4,169	
June	12·4	4·7	7·3	·16	·18	434	
July	16·2	3·1	5·6	·13	·15	344	
August	4·7	1·3	2·0	·04	·05	123	
The period							

NOTE.—These figures do not represent the natural flow of Monte creek at this point, since a large percentage of the water is diverted into Summit lake above this station. This station was maintained during the irrigation season only. The winter flow is unimportant, even for storage.
Accuracy, "A" and "B."

(3) *Monte creek diversion to Summit lake* (254).—The station on Monte creek diversion to Summit lake was established on May 25, 1911, by C. E. Richardson. The diversion is about half a mile long, and the water flows into the north end of Summit lake. The headgate on Monte creek is about 12 miles from the mouth and 100 yards above the hydrographic station called Monte creek at Graham's ranch.

The measuring section on the diversion is located 75 yards below the headgate, half a mile from Summit lake and 6 miles from Grande Prairie. The gauge is a standard vertical staff fastened to the left abutment of the headgate. All measurements are made with the wading equipment. The channel above and below the measuring section is straight for 25 feet, the bed is rough, and the banks gradually sloping, confining all the water to one channel at all stages.

The gauge was established at the headgate. The water is changed from one channel to the other by moving logs and rocks. So every time the water is changed the gauging section is changed. In 1911 no changes were made; but, due to the continual changing in 1911, no daily discharges were obtained. A new station will be established in 1913.

DISCHARGE MEASUREMENTS of Monte creek, diversion to Summit lake, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 25 ...	W. M. Carlyle	1014	4·7	10·2	3·2	1·15	32·7
June 15	"	1041	13·6	6·0	1·5	0·58	8·8
July 10	"	1041	13·5	4·6	1·1	0·39	5·0
[illegible] 24	"	1014	6·0	2·4	[illegible] 1	0·1	0·9
[illegible]	"	1041	2·0	0·6	0·4	0·03	0·2
1912.							
[illegible] 1	C. E. Richardson	1048	9·0	7·0	1·6	0·6	10·8
[illegible]	"	1018	4·0	1·6	1·2	0·31	1·9
[illegible] 17	"	1018	5·0	1·5	1·2	0·32	1·7
Aug 27	"	1049	3·0	0·7	0·6	0·18	0·4

DAILY GAUGE HEIGHT AND DISCHARGE of Monte creek, diversion to Summit lake, for 1911.

Day.	May. Gauge height	May. Discharge	June. Gauge height	June. Discharge	July. Gauge height	July. Discharge	August. Gauge height	August. Discharge	September. Gauge height	September. Discharge	October. Gauge height	October. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·10	30·4	0·20	2·0	0·12	1·1	0·10	0·9	0·10	0·9
2			1·12	31·1	0·20	2·0	0·12	1·1	0·10	0·9	0·10	0·9
3			1·02	26·6	0·20	2·0	0·10	0·9	0·07	0·6		
4			0·95	23·4	0·20	2·0	0·10	0·9	0·05	0·6		
5			0·88	20·3	0·20	2·0	0·10	0·9	0·05	0·6		
6			0·82	17·8	0·20	2·0	0·12	1·1	0·05	0·6		
7			0·80	17·0	0·25	2·7	0·15	1·5	0·05	0·6		
8			0·75	15·1	0·28	3·1	0·15	1·5	0·10	0·9		
9			0·72	13·8	0·30	3·4	0·12	1·1	0·10	0·[illegible]		
10			0·70	13·2	0·40	5·1	0·12	1·1	0·10	0·9		
11			0·70	13·2	0·35	4·2	0·10	0·9	0·10	0·9		
12			0·68	12·6	0·30	3·1	0·10	0·9	0·10	0·9		
13			0·65	11·6	0·28	3·1	0·08	0·8	0·10	0·9		
14			0·62	10·7	0·22	2·3	0·05	0·6	0·10	0·9		
15			0·58	9·5	0·22	2·3	0·05	0·6	0·10	0·9		
16			0·40	[illegible]	0·20	2·0	0·02	0·4	0·10	0·9		
17			0·35	4·2	0·20	2·0	00·1	0·9	0·05	0·6		
18			0·35	4·2	0·20	2·0	00·1	0·9	0·05	0·6		
19			0·32	3·7	0·20	2·0	00·1	0·9	0·05	0·6		
20			0·32	3·7	0·20	2·0	00·1	0·9	0·05	0·6		
21			0·32	3·7	0·22	2·3	00·1	0·9	0·05	0·6		
22			0·30	3·4	0·20	2·0	00·1	0·9	0·05	0·6		
23			0·30	3·1	0·18	1·8	00·1	0·9	0·05	0·6		
24			0·28	3·1	0·10	0·9	00·1	0·9	0·10	0·9		
25	1·15	32·9	0·25	2·7	0·10	0·9	00·1	0·9	0·10	0·9		
26	1·05	28·0	0·22	2·3	0·17	1·5	00·1	0·9	0·10	0·9		
27	1·05	28·0	0·20	2·0	0·15	1·5	00·1	0·9	0·10	0·9		
28	1·05	28·0	0·20	2·0	0·15	1·5	00·1	0·9	0·10	0·9		
29	1·05	28·0	0·20	2·0	0·15	1·5	00·1	0·9	0·10	0·9		
30	1·08	29·5	0·20	2·0	0·15	1·5	00·1	0·9	0·10	0·9		
31					0·15	1·5	00·1	0·9				

MONTHLY DISCHARGE of Monte creek, near diversion to Summit lake, for 1911

Month.	Discharge in Second Feet. Maximum	Minimum	Mean.	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre feet	Rain fall. Inches.
June	30·4	2·0	10·7			637	
July	5·1	1·1	2·2			135	
August	1·4	0·1	0·9			55	
September	0·9	0·6	0·8			18	

NOTE.—The station was continued only during the irrigation season. The creek freezes over three months in the year.

Accuracy, "C."

MOULTON CREEK.

Moulton creek (or Deep creek) is a small though somewhat contentious irrigation stream rising in the hills just south of the source of Paul creek, at an elevation of 3,500 feet, and discharging into the South Thompson near Pritchard, B.C., at an elevation of 1,150 feet. Its total drainage area is about 6 square miles, while above the gauging station it is about 5 square miles. At the mouth of the creek, conditions peculiar to the Dry Belt exist, and the precipitation in an average year is about 10 inches. At its source in the Back valley, where the catchment basin is heavily timbered, the rainfall and snowfall combined would, under average conditions, make a total precipitation of about 20 inches. Moulton creek is about 6 miles in length, about 3 feet wide and varies in depth from 1 to 8 inches. The flow is very small, but the creek seldom runs dry since it is no doubt fed by springs and seepage from Paul creek. There is no suitable storage on the creek, although McIvors meadow might be used if the cost were not prohibitive.

The station was established by C. G. Cline on August 26, 1911, and semi-weekly gauge readings were taken till freeze-up in 1911, and during the irrigation season of 1912. The gauge is a vertical staff gauge and is nailed to a 10-inch pine on the right bank of the stream, 100 feet above the highest diversion. Measurements are made 15 feet above the gauge by wading during the higher stages, and by means of floats during low water.

The bed of the stream is of rocks and mud, while the banks are 3 feet high and clear of bushes. There is no danger of overflow.

The elevations of the two bench-marks are referred to the datum of the gauge.

DISCHARGE MEASUREMENTS of Moulton Creek River, two miles from mouth, 1911-12.

Date	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
[illegible] 12	C. G. Cline					1.2	0.3
[illegible] 20	Cline and Dee E. M. Dee	1036	1	0.17	0.4	1.15 1.3	0.07 1.9

SEMI-WEEKLY GAUGE HEIGHT AND DISCHARGE of Moulton creek, two miles from mouth, for 1911.

Day.	August		September		October	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1						
2					1.0	0.0
3						
4			1.0	0.0		
5					1.0	0.0
6						
7			1.0	0.0		
8						
9					1.05	
10						
11			1.0	0.0		
12				0.01	1.1	
13				0.05		
14			1.05	0.05		[illegible]
15				0.03		[illegible]
16				0.02	1.1	[illegible]
17				0.01		0.1
18			1.0	0.0		0.1
19					1.1	0.1
20						0.1
21			1.0	0.0		0.1
22						0.1
23					1.1	0.1
24						0.1
25			1.0	0.0		0.1
26	1.0	0.0			1.1	0.1
27						0.1
28	1.0	0.0	1.0	0.0		0.1
29						0.1
30	1.0	0.0			1.1	0.1
31						0.1

MONTHLY DISCHARGE of Moulton creek, two miles from mouth, for 1911.
(Drainage area, 5 square miles.)

Month.	Discharge in Second Feet.				Run-Off.		Rainfall
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
September	0.05	0.0	0.005	0.001	0.001	0.3	
October	0.1	0.0	·07	·01	·01	4	
The period							10

NOTE.—Station was established August 26, 1911.
Accuracy "C."

SEMI-WEEKLY GAUGE HEIGHT AND DISCHARGE of Moulton creek, two miles from mouth, for 191[illegible].

Day	April Gauge height	April Discharge	May Gauge height	May Discharge	June Gauge height	June Discharge	July Gauge height	July Discharge	August Gauge height	August Discharge	September Gauge height	September Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·17	0·3		11·2		0·[illegible]		0·08	1·05	0·65		0·09
		0·3	1·6	10·6		0·[illegible]	1·07	0·08		0·05	1·1	0·01
		0·3		9·5	1·2	0·1		0·12		0·05		0·09
	17	0·3		8·4		0·3	1·12	0·16		0·05	1·07	0·07
5		0·3	1·5	7·4		0·2		0·16		0·07		
		0·1		7·0	1·15	0·2		0·16	1·05	0·07		
		0·1		6·[illegible]		0·2		0·16		0·0[illegible]		
		0·1		6·2		0·2	1·12	0·16	1·02	0·0		
		0·1	1·45	5·8		0·2		0·16		0·03		
		0·1		5·0	1·15	0·2		0·16		0·04		
	2	0·1		4·3		0·2		0·16		0·04		
		0·1		3·6		0·3	1·12	0·16		0·05		
		0·1	1·35	2·9	1·07	0·3		0·11	1·05	0·05		
		0·1		2·1		0·3		0·12		0·05		
	2	0·1		2·0		0·3		0·10	1·05	0·05		
		0·8	1·3	1·6		0·2	1·07	0·08		0·04		
		1·2		1·6	1·15	0·2		0·06		0·03		
	1·3	1·6		1·6		0·2	1·05	0·05		0·02		
	1·4	1·2		1·6		0·2		0·06	1·0	0·0		
		4·2	1·3	1·6	1·15	0·2		0·07		0·0		
21		1·2		1·4		0·15		0·07		0·0		
22	1·4	4·2		1·2		0·10	1·07	0·08	1·0	0·0		
23		5·8	1·25	1·0		0·10		0·09		0·0		
24		7·4		1·0	1·05	0·05		0·09		0·0		
25	1·55	9·0		1·0		0·05	1·1	0·10		0·03		
26	1·6	10·6		1·0		0·05		0·09	1·02	0·03		
27.		10·6	1·25	1·0	1·05	0·05		0·08		0·03		
28.	1·6	10·6		0·8		0·05		0·07		0·03		
29.	1·65	12·2		0·6		0·05		0·06	1·03	0·03		
30.		11·7	1·2	0·4		0·05	1·05	0·05		0·05		
31				0·1				0·05		0·07		

MONTHLY DISCHARGE of Moulton creek, two miles from mouth, for 1912.

(Drainage area, 5 square miles.)

Month.	Discharge in Second Feet.				Run-Off.		Rain Fall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	12·2	0·3	3·46	0·69	0·77	206	
May	11·2	0·4	3·57	0·71	0·82	220	
June	0·4	0·05	0·19	0·04	0·015	11	
July	0·16	0·05	0·10	0·02	0·023	6	
August	0·07	0·0	0·03	0·006	0·007	2	
The period							12[illegible]

NOTE.—Station was maintained during irrigation season only.
Accuracy "C."

MURRAY CREEK (263).

Murray creek rises in the Murray mountains at an elevation of 4,000 feet and flows southeast, discharging into Thompson river at Spence's Bridge at an elevation of 760 feet. It is about 10 miles long, about 15 feet wide, varying in depth from 0·5 feet to 3·0 feet, and with a mean velocity of from 1 to 3 feet per second. The precipitation is small, not exceeding 20 inches; the summers are dry and hot, and the winters not severe, with 4 or 5 feet of snow. Murray creek flows down from Murray mountain winding in and out of little canyons, and over little falls and rapids. The valley is small and rough, being covered with small underbrush and timber.

A quarter of a mile from the mouth there is a fall of over 200 feet. At this point the flow of the creek is diverted through a rock tunnel and the full head utilized for the development of power to light the town of Spence's bridge. The water is also used for irrigation and domestic purposes.

The station was established by C. E. Richardson on September 15, 1911, and located above all diversions, 400 yards from Thompson river and three-quarter of a mile from Spence's Bridge.

The gauge is a vertical staff gauge, 5 feet long, and is on the right bank of the stream, 50 yards above the mouth of the tunnel. The bed of the stream is rocky, and the flow is confined to one channel by the walls of the canyon through which it flows.

DISCHARGE MEASUREMENTS of Murray creek, above diversions, 1911-12.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1912.			Feet	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 4...	C. F. Richardson.	1,048	17	17·1	1·4	0·78	23·5
May 21.	C. G. Cline.	1,046	19·	33·0	1·8	1·50	58·1
June 28.	B. Corbould..	1,053	8·3	6·0	2·1	0·68	12·8
July 18.	"	1,044	7·3	4·9	2·7	0·65	13·3
Aug. 2...	"	1,044	7·5	3·8	2·3	0·5	8·8
1911							
Sept. 15	"					*	9·8
Oct. 24	"					*	10·5

*No gauge heights, gauge destroyed

WEEKLY GAUGE HEIGHT AND DAILY DISCHARGE

Day	May		June		July		August	
	Gauge height	Discharge	Gauge height.	Discharge.	Gauge height	Discharge	Gauge height	Discharge
	Feet	Sec.-ft	Feet	Sec.-ft	Feet	Sec.-ft	Feet	Sec.-ft
1				[illegible]		[illegible]		11
2			1·0	25		[illegible]		11
3				27		21		10·5
4				[illegible]		22	0·55	10·5
5	[illegible]	23		[illegible]		23		10·5
6		24		[illegible]		21		10·5
7		27		25	0·[illegible]	25		10·5
8		26		24		21		10·5
9		28	0·9	23		24		10·5
10		[illegible]		23		23		10·5
11		31		22		23	0·55	10·5
12	1·1	33		22		22		11
13		33		21		22		12
14		34		20	0·85	24		13
15		31		[illegible]		19		14
16		35	0·8	19		17		15
17		35		[illegible]		15		16
18		36		[illegible]	0·65	14	0·75	17·0
19	1·1[illegible]	36		21		15		16
20		36		21		16		15
21		37		22	0·75	17		14
22		37		22		16		13
23		38	[illegible]	23		16		12
24		38		22		15		11
25		39		22		11	0·55	10·5
26	1·2	39		21		14		10·5
27		38		[illegible]		13		10·5
28		37		[illegible]0	0·6	12		10·5
29		36		20		12		10·5
30		31	0·8	19		12		10·5
31		32				11		10·5

of **Murray creek, above diversions, for 1912.**

September.		October.		November.		December.		Day.
Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
0.55	10.5		9		10	0.45	7.5	1
	10.5		10		9		7.5	2
	10.5		10		9		7.5	3
	10.5		10	0.5	9.0		7.5	4
	10.5		10		10		7.5	5
	10.5	0.55	10.5		10		7.5	6
	10.5		10		11		7.5	7
0.55	10.5		10		11	0.45	7.5	8
	10.5		10		12		7.5	9
	10		10	[illegible]	12.0		7.5	10
	10		9		12		7.5	11
	10		9		12		7.5	12
	9		9		11		7.5	13
	9	0.5	9.0		11		7.5	14
[illegible]	9		9		11	0.45	7.5	15
	9		9		10		7.5	16
	9		10		10		7.5	17
	9		10	0.55	10.5		7.5	18
	9	0.55	10.5		10		7.5	19
	9		10.5		10		7.5	20
	9		10.5		10		7.5	21
0.5	9		10.5		9	0.45	7.5	22
	9		10.5		9		7.5	23
	9		10.5	0.5	9.0		7.5	24
	9		10.5		9		7.6	25
	9		10.5		9		7.0	26
	9	0.55	10.5		8		6.5	27
	9		10.5		8		6.5	28
0.5	9		10.5		8		6.0	29
	9		10		7.5	0.4	6.0	30
			10				6.0	31

MONTHLY DISCHARGE of Murray creek, above diversions, for 1912.

(Drainage area, 36 square miles.)

Month.	Discharge in Second Feet.				Run-Off.		Rain-Fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	39	23	33·5	·93	1·1	2,060	
June	30	19	22·5	·63	·7	1,330	
July	25	11	18·1	·5	·58	3,110	
August	17	10·5	11·9	·33	·38	732	
September	10·5	9·0	9·5	·26	·29	565	
October	10·5	9·0	10·0	·28	·32	615	
November	12·0	7·5	9·9	·28	·31	589	
December	7·5	6·0	7·3	·2	·23	419	
The period							15

NOTE.—Accuracy, C

NAHATLATCH RIVER (127).

Nahatlatch river rises in the mountains north of Harrison lake, out-side the Railway Belt, at an elevation of about 6,000 feet, and discharges into Fraser river at an elevation of 360 feet. It is part of the Fraser drainage. Douglas creek flows into the Nahatlatch from the south, and Log creek from the north. These two streams are close together and only a short distance below the lakes. The drainage area of the Nahatlatch at the upper measuring section, which is above the two tributaries, is 200 square miles; and the area above the mouth of the stream is 250 square miles. One very small tributary is used for irrigation, but the water of the main stream is not used in any way at present. The stream however, has a good site for the development of water-power.

The upper part of the water-shed of the Nahatlatch is rough and mountainous, with some peaks on which the snow remains until quite late in the fall. The country is timbered, and some of the timber is very good. Near the lakes the valley is quite wide, and for several miles above the lake the river flows quite slowly and sometimes overflows its banks and floods the hay meadows at the head of the lakes. The lakes themselves are at an elevation of 900 feet. There are four lakes in all, three of them being at practically the same elevation while the last is from 15 to 20 feet below. The three upper lakes are, together, 7 miles long, while the lower is about half a mile, with half a mile of rapids between. The width varies from one-quarter of a mile to a mile. The hills rise quite steeply from the water's edge except at the mouth of two or three creeks, where there are deltas. Snowslides are quite frequent, and it is very hard to keep a trail open along the lakes. The lake is quite deep in most parts. There is good fishing in the lakes and in the river.

Below the lakes the river is a series of rapids, falling 550 feet in 8 miles. It is for this reason that no attempt has been made to run logs in the river. But with this fall it would be quite possible to develop a large amount of power. The lakes would provide the necessary storage. The great drawback to the scheme is the necessity for about 7 miles of flume and pipe line, necessitating a large expense for construction and considerable attention during operation to prevent damage from slides and falling timber. Probably as much as 30,000 horse-power could be developed if desired

There is some land being cultivated near the mouth of the Nahatlatch river. Fruit seems to do fairly well there. There is one homesteader about 4 miles up the valley, and there is no one beyond him. A few years ago, part of the hay meadow at the head of the lakes was taken up as a homestead, but a big log jam in the river caused the flooding of the meadows and the house was washed away; since that time no attempt has been made to cultivate that land. The use of the lakes for storage for power purposes will mean that this land will be flooded, and it is merely a matter of deciding which will be of greater value.

Gauging stations were established at two places on the Nahatlatch. One is at the outlet of the lakes and gives the flow from them; the other is 2 miles below the lakes and gives the total flow of the stream, including the two tributaries, Douglas creek and Log creek, which enter about half a mile below the lakes. The river is very rapid and the bed thickly strewn with large boulders, but by carefully choosing the section, blasting out some of the worst boulders and putting up cables and cars, two fairly good metering stations were obtained. Part of this work was done by engineers of the Canadian Pacific Railway Company who were investigating the power possibilities of the stream. Gauges were established and are being read by Chas. Nicholson, a prospector, who is the only person living in the Nahatlatch valley. He is four miles from the farthest gauge, and makes the trip once a week. The stations were established on February 26, 1912, and weekly gauge readings have been taken at both stations continuously since that date. The discharges at the upper station have been worked out; but at the lower station this cannot be done until some more meter measurements are made at the proper stages of the river.

The upper station is 8 miles west of Keefer station, and 200 yards east of the lowest of the Nahatlatch lakes. There is a chain gauge of No. 12 steel Jack chain with a six-pound sash weight. The chain runs over a pulley on the end of a log, supported against two trees, and overhanging the stream; it is referred to three permanent bench-marks. For the meter measurements there is a half-inch steel cable stretched across the stream and supported by trees on each bank, a substantial car is suspended from cable by means of two heavy snatch blocks and the engineer can thus place himself directly over any part of the section and take measurements with a meter suspended by its cable. The channel above the station is straight for 100 feet, with the water flowing smoothly. About 100 feet above the section there are rapids when the water leaves the lake. Below the section the channel is straight for 100 feet and then the rapids commence again. The right bank is 100 feet high, with a steep slope, the left bank is 50 feet high, with a fairly steep slope and with bushes and trees above the high-water mark. The bed of the stream is covered with rocks and boulders and these make it rather difficult to get accurate measurements. There is only one channel, about 4 feet deep at low water.

DISCHARGE MEASUREMENTS of Nahatlatch River, below Nahatlatch lakes, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
[illegible] 25	C. G. Cline	1,046	65	256	1·6	3·45	417
[illegible] 18	"	1,046	105	530	3·6	6·58	1,930
[illegible] 28	"	1,018	80	381	2·4	4·75	817

WEEKLY GAUGE HEIGHT AND DAILY DISCHARGE

Day.	February.		March.		April.		May.		June.		July.	
	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				395	3·95	520		980		1,945		1,385
2				390		525		1,055	6·4	1,800		1,440
3				385		530		1,130		2,010		1,500
4			3·25	380		535		1,200		2,280		1,560
5				380		540	5·6	1,270		2,525		1,620
6				380		550		1,490		2,770		1,675
7				380		555		1,710		3,010	6·3	1,730
8				380	4·1	560		1,930		3,250		1,830
•9				375		575		2,150	8·7	3,490		1,940
10				375		590		2,370		3,320		2,005
11			3·20	375		605		2,590		3,150		2,100
12				375		620	7·8	2,815		2,980		2,190
13				375		635		2,760		2,810		2,280
14				375	4·4	660		2,700		2,640	7·2	2,370
15				375		680		2,630		2,470		2,280
16				375		705		2,585	6·95	2,295		2,190
17				375		730		2,530		2,240		2,100
18			3·20	375		740		2,470		2,190	6·7	2,010
19				375		785	7·4	2,415		2,140		2,010
20				370		810		2,150		2,090		2,010
21				370	4·8	830		2,530		2,040	6·7	2,010
22				370		825		2,585		1,990		2,075
23				370		820		2,640	6·6	1,940	6·5	1,940
24				365		810		2,700		1,850		1,825
25			3·40	365		805		2,760		1,760		1,710
26	3·45	415		390		795	7·8	2,815		1,670		1,590
27		410		410		790		2,670		1,590		1,475
28		405		435	4·7	785		2,525		1,500	5·75	1,360
29		400		455		855		2,380		1,420		1,400
30				470		925		2,235	5·7	1,330		[illegible]
31				495				2,090				[illegible]

of Nahatlatch River, below Nahatlatch lakes, for 1912.

August.		September.		October.		November.		December.		Day.
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
	1,515	4·7	785		600		545	4·15	680	1
	1,550		790		625		530		660	2
	1,590		795		650	3·9	510		640	3
6·15	1,625		800		675		510		620	4
	1,580		810		700		515		600	5
	1,535		815	4·55	720		520		580	6
5·95	1,490		825		690		525	4·1	560	7
	1,660	4·8	830		660		530		540	8
	1,820		860		630		535		525	9
	1,990		895		600	4·0	535		510	10
6·9	2,155		930		570		570		495	11
	2,065		965		540		610		480	12
	1,975		1,000	3·9	510		645		465	13
	1,865		1,030		550		680		450	14
	1,785	5·25	1,060		585		715	3·55	430	15
	1,700		1,010		620		750		430	16
	1,615		960		655	4·7	785		435	17
6·0	1,525		910		690		815		440	18
	1,560		855		725		845		445	19
	1,600		800	4·65	760		880		450	20
	1,640		750		740		910		455	21
	1,680	4·5	700		720		950	3·7	460	22
	1,720		680		700		980		470	23
	1,760		660		680	5·15	1,010		480	24
6·1	1,800		640		660		960		490	25
	1,655		620		640		910		505	26
	1,510		600	4·3	625		860		515	27
	1,365		580		610		805		525	28
	1,220	4·1	560		590	4·75	760	4·0	535	29
	1,075		580		575		720		545	30
	930				560				535	31

MONTHLY DISCHARGE of Nahatlatch River, below Nahatlatch lakes, for 1912.
(Drainage area, 200 square miles.)

Month.	Discharge in Second-Feet.				Run Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet
March	495	365	389	1·9	2·2	23,900
April	925	520	690	3·4	3·8	41,000
May	2,835	980	2,230	11·3	12·8	137,000
June	3,490	1,330	2,284	11·4	12·7	136,000
July	2,370	1,360	1,822	9·1	10·5	112,000
August	2,155	930	1,631	8·1	9·3	100,000
September	1,060	560	803	4·0	4·5	47,000
October	760	510	640	3·2	3·7	39,400
November	1,030	510	714	3·6	4·0	42,500
December	680	430	518	2·6	3·0	31,850

NOTE.—Drainage area of Nahatlatch area has been estimated from best available maps, which are very inaccurate. The run-off of 66 inches in ten months seems to show that the drainage area is larger than 200 square miles.

Accuracy, "A" and "C."

NED'S CREEK.

Ned's creek is a small irrigation stream rising in the hills on the south side of south Thompson river, 8 miles east of Ducks, at an elevation of 2,590 feet. The stream flows in a northwesterly direction, discharging into south Thompson river at an elevation of 1,150 feet, in township 19-14-6.

Ned's creek is about 5 miles long, from 4 feet to 8 feet wide and from 6 inches to 1 foot deep. The drainage area is about 4 square miles. The precipitation is about 10 inches. The summers are very hot and dry, the winters are not severe (—20 F.) and there is very little snow.

Ned's creek is used for irrigation and domestic purposes. The stream is over recorded and contentious. There are small parcels of land up the valley, but most of the water is used to irrigate the land in the Thompson valley in the vicinity.

The gauging station was established on May 31, 1911, by C. E. Richardson. The gauge is a standard staff, and located 30 feet above Senator Bostock's diversion, about half a mile above the wagon road from Ducks to Chase. Readings have been taken during the irrigation seasons of 1911 and 1912.

DISCHARGE MEASUREMENTS of Ned's creek, above Bostock's diversion, 1911-12.

Date	Hydrographer	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
1911			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
May 31	C. E. Richardson	1048	3·5	1·1	2·0	0·95	2·4
1912.							
May 11	C. E. Richardson	1048	6·0	3·5	2·4	1·23	8·4

DAILY GAUGE HEIGHT AND DISCHARGE of Ned's creek above Bostock's diversion, for 1911.

Day.	June. Gauge height.	June. Discharge.
	Feet.	Sec.-ft.
1	0·95	2·6
2	0·92	2·2
3	0·89	1·8
4	0·78	0·9
5	0·8	1·0
6	0·86	1·5
7	0·85	1·4
8	0·82	1·2
9	0·82	1·2
10	0·81	1·1
11	0·8	1·0
12	0·81	1·1
13	0·78	0·9
14	0·76	0·8
15	0·75	0·7
16	0·7	0·5
17	0·72	0·6
18	0·7	0·5
19	0·68	0·4
20	0·68	0·4
21	0·65	0·3
22	0·70	0·5
23	0·70	0·5
24	0·68	0·4
25		
26		
27		
28		
29		
30		

MONTHLY DISCHARGE of Ned's creek, above Bostock's diversion, for 1911.

(Drainage area, 4 square miles.)

Month.	Discharge in Second-Feet. Maximum	Minimum	Mean	Per sq. mile.	Run-Off. Depth in inches on Drainage area.	Total in acre-feet.
..	2·6	0·3	1·0	0·25	0·28	60

NOTE.—Accuracy, "D."

DAILY GAUGE HEIGHT AND DISCHARGE of Ned's creek, above Bostock's diversion, for 1912

Day	May		June		July	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·85	1·1	0·68	0·4
2			0·82	1·2	0·70	0·5
3			0·82	1·2	0·72	0·6
4			0·82	1·2	0·75	0·8
5			0·80	1·0	0·75	0·8
6			0·80	1·0	0·75	0·8
7			0·80	1·0	0·72	0·6
8			0·78	0·9	0·70	0·[illegible]
9			0·75	0·8	0·65	0·3
10			0·75	0·8	0·60	0·[illegible]
11			0·75	0·8	0·55	0·2
12			0·78	0·9	0·52	0·1
13			0·78	0·9	0·52	0·1
14	1·28	8·2	0·90	1·9	0·52	0·1
15	1·32	10·8		1·6	0·52	0·1
16	1·30	10·3		1·2	0·50	0·[illegible]
17	1·20	7·7	0·78	0·9	0·50	0·1
18	1·08	4·9	0·75	0·8	0·50	0·1
19	1·08	4·9	0·72	0·6	0·58	0·[illegible]
20	1·05	4·3	0·70	0·5	0·65	0·[illegible]
21	1·02	3·7	0·70	0·5	0·65	0·[illegible]
22	0·98	3·0	0·68	0·4	0·62	0·3
23	0·98	3·0	0·65	0·3	0·55	0·[illegible]
24	0·98	3·0	0·60	0·2	0·52	0·[illegible]
25	1·05	4·3	0·60	0·2	0·52	0·[illegible]
26	1·00	3·4	0·65	0·3	0·50	0·1
27	0·98	3·3	0·62	0·3	0·50	0·1
28	0·95	2·6	0·65	0·3	0·50	0·[illegible]
29	0·92	2·2		0·3	0·50	0·1
30	0·92	2·2		0·4	0·50	0·[illegible]
31	0·9	1·9			0·50	0·[illegible]

MONTHLY DISCHARGE of Ned's creek, above Bostock's diversion, for 1912.
(Drainage area, 4 square miles.)

Month.	Discharge in Second Feet				Run-Off	
	Maximum	Minimum	Mean	Per square mile	Depth in inches on Drainage area	Acre-feet
June	1·1	0·2	0·8	0·20	0·22	48
July	0·8	0·1	0·27	0·07	0·08	17

NOTE.—The computations are based on only two measurements.

NELSON CREEK (246).

Nelson creek has its source south of Barnes lake at an elevation of 2,000 feet. It discharges into Thompson river from the east, 5 miles south of Ashcroft, at an elevation of 900 feet, and is part of the Thompson River drainage. The watershed is small (only about 8 square miles) and water is diverted into the stream from Barnes lake, for use in irrigation. Nelson creek is in the driest part of the Dry Belt, with a mean annual precipitation of about 8 inches. The summers are hot and dry; the winters cold and dry.

Nelson creek carries a small run-off from a limited watershed south of Barnes lake, and is dry most of the year. The natural flow of the stream is supplemented by water which is diverted from Barnes creek. This water is run into Barnes lake in the first place, where it is stored until required. It can be run from Barnes lake back into Barnes creek or on into another small lake which feeds Nelson creek. From this second lake it may be run into Nelson creek or may be run directly into irrigation ditches.

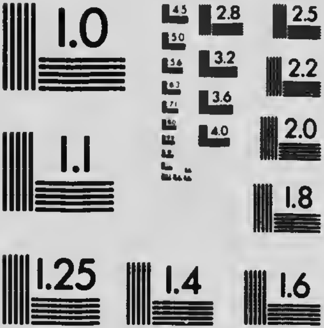
A gauging station was established on Nelson creek on May 11, 1912, and daily gauge readings were taken to September 12 of the same year. This covers the irrigation season. The station is above all diversions both into the stream and out of it, and so gives the natural flow of the stream. But, of course, 1912 was a particularly wet year in that district; often there is no flow at all after June. The gauge is at Williams ranch, near Ashcroft, 25 feet above the diversion from Barnes lake, and 50 feet above the highest diversion from the creek, and half a mile from the main road along the east side of the Thompson. The gauge is a vertical staff, 5½ feet long, nailed to the roots of a small poplar tree on the right bank of the creek, and is referred to a bench-mark. The meter measurements were made at a section 20 feet below the gauge with the meter on a rod and the observer standing on two logs thrown across the stream for a bridge. There is a small fall 25 feet above the section, and swift water in a straight channel for 25 feet below. The banks are high and wooded and not liable to overflow. The bed of the stream is clean and rocky, with the water 6 inches deep in the freshet.

DISCHARGE MEASUREMENTS of Nelson Creek, above diversions, 1912.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity	Gauge height.	Discharge
			Feet	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 11	C. G. Cline	1016	1.5	1.9	2.9	0.90	5.6
[illegible] 21	C. G. Cline and B. Corbould	1016	2.5	0.8	0.6	0.27	0.4
[illegible] 8	B. Corbould	1044	4.0	1.4	2.0	0.55	2.9
[illegible]y 27	"	1044	3.0	0.9	1.1	0.38	1.3
[illegible]g. 17	"	1044	2.5	0.5	0.9	0.3	0.5

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



GAUGE HEIGHT AND DISCHARGE of Nelson Creek, above diversions, for 1912.

Day.	May.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				1·4		1·4	0·3	0·6
2				1·4		1·4	0·4	1·4
3				1·4		1·4	0·4	1·4
4				1·4		1·4	0·3	0·6
5			0·4	1·4		1·4	0·3	0·6
6				1·5		1·4	0·3	0·6
7				1·6		0·6	0·3	0·6
8				1·8		0·6	0·3	0·6
9				2·0		0·6	0·3	0·6
10			0·5	2·2		0·6	0·3	0·6
11	0·9	5·7		2·2		0·6	0·3	0·6
12				2·2		0·6	0·3	0·6
13	0·8	4·8	0·5	2·2		0·6		
14				2·0		0·6		
15	0·7	4·0		1·7		0·6		
16			0·4	1·4		0·6		
17	0·6	3·1		1·2	0·3	0·6		
18				1·0		0·6		
19				0·8	0·3	0·6		
20	0·5	2·2	0·3	0·6	0·3	0·6		
21	0·5	2·2		0·8	0·3	0·6		
22				1·0	0·3	0·6		
23	0·4	1·4		1·2	0·3	0·6		
24			0·4	1·4	0·3	0·6		
25	0·4	1·4		1·4	0·3	0·6		
26				1·4	0·3	0·6		
27	0·3	0·6	0·4	1·4	0·3	0·6		
28			0	1·4	0·3	0·6		
29	0·3	0·6		1·4	0·3	0·6		
30				1·4	0·3	0·6		
31	0·3	0·6		1·4	0·3	0·6		

MONTHLY DISCHARGE of Nelson Creek above diversion, for 1912.

(Drainage area, 5 square miles.)

Month	Discharge in Second Feet.				Run Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
July	2·2	0·6	1·5	0·2	0·2	92
August	1·4	0·6	0·8	0·1	0·1	49
The period.						10

NOTE. Accuracy, "D."

NICOLA RIVER (210 AND 211.)

Nicola river is 45 miles long and rises in Nicola lake, at an elevation of 2,020 feet, and discharges into Thompson river near Spence's Bridge, at an elevation of 700 feet. The mean annual precipitation over the whole drainage area is very small, not exceeding 15 inches. The area of the watershed is 2,650 square miles, 1,150 square miles of which lies above the mouth of Coldwater river. Nicola lake is 10 miles long and from half a mile to 1½ miles wide. It is fed chiefly by the following streams:—

(1) Quilchena creek which rises in the hills 15 miles south of Nicola lake, at an elevation of 3,000 feet.

(2) Upper Nicola river, which rises in the Trepange plateau, some 25 miles southeast of Nicola lake, at an elevation of 4,000 feet. Chaperon and Douglas lakes are both tributaries of this stream.

(3) Stump lake, and its tributaries, 10 miles northeast of Nicola lake.

(4) Moore creek, which rises in the hills 10 miles north of Nicola lake.

From Nicola lake, the Nicola flows in a southwesterly direction for 7 miles to Merritt, where it is joined by Coldwater river. The Coldwater is a large and flashy stream, draining 360 miles of country south of Merritt, and rising on the east slope of Anderson River mountain at an elevation of 4,000 feet. From Merritt the Nicola flows in a Northwesterly direction for 40 miles to discharge into Thompson river near Spence's Bridge at an elevation of 650 feet. At Lower Nicola, 35 miles from the mouth, Guichon creek enters. Guichon creek is a very contentious irrigation stream, and drains 475 square miles of land, a large percentage of which is suitable for cultivation. (*See* Gazeteer on Guichon creek). At Canford, 29 miles from the mouth, Spius creek flows into the Nicola. Spius creek drains 160 square miles of land east of Canford, rising 10 miles northwest of the source of Coldwater river, at an elevation of 3,500 feet.

The Nicola valley is a famous ranching country, the rolling hills being very suitable for grazing lands; possibly the most celebrated district in the valley is the Douglas Lake country; here some 100,000 acres of land are controlled by one company, known as the Douglas Lake Cattle Co.

Good agricultural districts are scattered all through the Nicola drainage. On Guichon creek alone, probably 20,000 acres of land are under cultivation. The land around Nicola lake is all taken up. All through the valley, however, in dry seasons, there is a scarcity of water, not so much due to the lack of water but to the lack of system in utilizing the water, and poor ditches.

A considerable amount of mining is carried on in the Nicola valley. At Merritt, three coal mines are in operation and, in the vicinity, several rich gypsum claims have been recorded.

Practically all water-power possibilities on Nicola river proper have been eliminated by the presence of the C.P.R. Nicola Valley branch. This railroad follows the river between Spence's Bridge and Merritt, and any development would interfere with the present right of way. There is small industrial power on Spius creek, but any installation would be expensive. Coldwater river affords similar opportunities to Spius creek, but the power all through the valley is very limited.

There are two stations on Nicola river. The upper one, at Merritt (211), was established on June 17, 1911, by C. E. Richardson, and continuous daily gauge readings were obtained until the end of December, 1912.

The measuring section is located on the upstream side of the highway bridge, immediately below the mouth of the Coldwater river. Merritt station is slightly over one mile distant by the C.P.R. track. Measurements are made by cable suspension.

The gauge is a 6-foot standard vertical gauge, nailed to the right abutment of the bridge on its upstream side.

The stream is confined between the bridge abutment to one channel, whose bed i gravelly.

The elevation of the south rail of the C.P.R. Spence's Bridge to Nicola branc at the crossing of the road to Collettsville, is 15·03 feet above the datum of the gaug

The station at the mouth of Nicola river (210) was established on June 19, 1911, by C. E. Richardson. The measuring section is located 200 yards from the mouth o the river on the upstream side of the highway bridge on the Spence's Bridge—Nicol road, 1¼ miles from Spence's Bridge. Measurements are made by cable suspensio. The gauge is painted in white on a large sloping rock on the right bank of the stream, about 600 yards above the measuring section. Each subdivision of the gauge was se by a level, so no bench-marks were necessary.

The river is always confined to one channel, whose bed is of rock and gravel with no vegetation. During high stages of Thompson river, water is backed up to th measuring section but not to the gauge.

Discharge Measurements of Nicola River, near mouth, 1911-12.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discha
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft
Aug. 8	C. E. Richardson	1048	120	244	3·3	2·65	816
Sept. 15.	"	1048	113	151	2·5	1·78	386
Oct. 24	"	1048	113	116	1·5	1·30	176
1912.							
Mar. 29	C. G. Cline	1046	105	127	1·9	2·00	242
May 3	C. E. Richardson	1048	128	348	4·6	4·40	1,600
May 27	C. G. Cline, B. Corbould	1046	140	658	6·1	6·60	3,990
July 3	B. Corbould	1044	130	399	3·2	4·20	1,298
July 20	"	1044	120	260	2·6	3·10	667
Aug. 10	"	1044	115	167	1·9	2·25	321

DAILY GAUGE HEIGHT AND DISCHARGE of Nicola River, near mouth (Lower Gauge), for 1911.

Day	August Gauge height	August Discharge	September Gauge height	September Discharge	October Gauge height	October Discharge	November Gauge height	November Discharge	December Gauge height	December Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2.3	640	1.62	319	1.55	290	1.3	175	1.8	
2	2.5	740	1.62	319	1.5	265	1.3	175	1.8	
3	2.6	790	1.7	355	1.45	240	1.25	155	1.7	
4	2.1	600	1.72	364	1.4	220	1.3	175	1.7	
5	2.3	640	1.8	400	1.4	220	1.3	175	1.8	
6	2.35	665	1.78	391	1.45	240	1.3	175	1.7	
7	2.7	840	1.7	355	1.42	229	1.3	175	1.7	
8	2.65	815	1.62	319	1.45	240	1.3	175	1.8	
9	2.5	740	1.5	265	[illegible]	225	1.3	175	1.8	
10	2.1	600	1.5	265	1.42	229	1.3	175	1.7	
11	2.3	640	1.45	250	1.40	220	1.3	175	1.7	
12	2.2	[illegible]	1.4	220	[illegible]	206	1.3	175	1.7	
13	2.4	750	1.55	[illegible]	1.35	198	1.3	175	1.8	
14	2.05	570	1.6	310	1.3	175	1.3	175	1.8	
15	2.0	500	1.78	391	1.3	175	1.3	175	1.8	
16	1.95	470	1.85	422	1.3	175	1.3	175	1.7	
17	1.95	470	1.8	400	1.3	175	1.3	175	1.7	
18	1.95	470	1.78	391	1.3	175	1.3	175	1.7	
19	1.9	445	1.78	391	1.3	175	1.3	175	1.7	
20	1.95	470	1.75	378	1.3	175	1.4	220	1.7	
21	1.92	454	1.72	364	1.3	175	1.5	265	1.8	
22	1.92	451	1.72	364	1.3	175	1.5	265		
23	1.90	445	1.72	364	1.3	175	1.6	310	2.2	
24	1.88	436	1.7	355	1.3	175	1.7	355	2.0	
25	1.85	422	1.67	342	1.3	175	1.6	310	1.9	
26	1.82	409	1.65	330	1.3	175	1.7	355	1.7	
27	1.78	391	1.62	319	1.3	175	1.7	355	1.8	
28	1.75	378	1.6	310	1.3	175	1.62	319	2.0	
29	1.72	364	1.6	310	1.3	175	1.70	355	1.8	
30	1.7	355	1.57	295	1.3	175	1.8	400	1.7	
31	1.68	346			1.3	175				

MONTHLY DISCHARGE of Nicola River, near mouth (Lower Gauge), for 1911.

(Drainage area, 2,650 square miles.)

Month	Discharge in Second-Feet: Maximum	Minimum	Mean	Per square mile	Run-Off: Depth in inches on Drainage area	Total in acre-feet	Rainfall: Inches
August	815	346	545	0.20	0.23	33,500	
September	422	220	335	0.13	0.145	19,900	
October	290	175	200	.076	.088	12,300	
November	400	155	227	.084	.093	13,500	
The period							11

NOTE.—The mean discharge in November is inclined to be in excess of the correct mean, due to partial condition existing in the latter part of November.

Accuracy, "C."

GAUGE HEIGHTS AND DAILY DISCHARGE OF

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				1,200	5·9	3,100	3·9	1,150
2				1,300	5·8	2,970	4·1	1,280
3				1,400	5·7	2,840	4·2	1,360
4				1,500	5·6	2,720	4·0	1,260
5	2·6	430	4·5	1,600	5·6	2,720	3·9	1,130
6		450		1,930	5·6	2,720	3·8	1,060
7		470		2,260	5·8	2,970	3·8	1,060
8		490		2,600	6·0	3,230	3·7	1,000
9		510		2,930	6·0	3,230	3·6	940
10		530		3,280	6·0	3,230	3·5	880
11		550		3,600	5·8	2,970	3·5	880
12		570	6·5	3,920	5·6	2,720	3·5	880
13		590		3,940	5·6	2,720	3·6	940
14	3·0	610		3,960	5·1	2,490	3·8	1,060
15		620		3,980	5·2	2,270		970
16		630		4,000	4·8	1,870	3·5	880
17		640		4,020	5·0	2,050		800
18		650		4,040	5·0	2,050		730
19		670	6·6	4,060	5·2	2,270	3·1	660
20		690	6·8	4,340	5·2	2,270		635
21	3·2	710	6·9	4,480	5·3	2,280	3·0	610
22		740	7·0	4,630	5·3	2,380		585
23		770	6·5	3,920	5·0	2,050	2·9	560
24		800	6·4	2,780	4·7	1,780		530
25		820	6·6	4,060	4·4	1,520		500
26		840	6·6	4,060	4·3	1,440	2·7	470
27		860	6·6	4,060	4·2	1,360		445
28	3·5	880	6·5	3,920	4·1	1,280		420
29		990	6·3	3,610	3·9	1,130	2·5	390
30		1,000	6·1	3,360	3·8	1,060		390
31			5·9	3,100			2·5	390

Nicola River, near mouth, for 1912.

August.		September.		October.		November.		December.		
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Day.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
	375		300	1·8	195		240	2·3	330	1
2·4	360	2·2	360		195		240		330	2
	370		315	1·8	195	2·0	240	2·3	330	3
	380	2·3	330		205		270		315	4
2·5	390		315	1·9	215	2·2	300	2·2	300	5
	390	2·2	300	1·9	215		330		300	6
2·5	390				215	2·4	360	2·2	300	7
	390			1·9	215		290		270	8
2·5	390				215	1·9	215	2·0	240	9
	370			1·9	215	2·0	240		220	10
	350				215		230	1·8	195	11
2·3	330			1·9	215	1·9	215		185	12
	380				215		230	1·7	175	13
2·6	430				215	2·0	240		165	14
	450			1·9	215		270	1·6	155	15
2·7	470				290	2·2	300		155	16
	530			2·4	360	2·4	360	1·6	155	17
	600				330		395		155	18
3·4	660			2·2	300	2·6	430	1·6	155	19
	520			2·3	330		440		155	20
2·5	390				315	2·5	390	1·6	155	21
	375			2·2	300		375			22
2·4	360				270	2·4	360			23
	340			2·0	240		345			24
	320				240	2·3	330			25
2·2	300			2·0	240		330			26
	300				240	2·3	330			27
2·2	300				240		315			28
	300	1·8	195		240	2·2	300			29
2·2	300				240		345			30
	300				240					31

MONTHLY DISCHARGE of Nicola River, near mouth, for 1912.
(Drainage area, 2,650 square miles.)

Month.	Discharge in Second Feet.				Run Off.		[illegible]
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area	Total in acre-feet.	[illegible]
April	1,000	130	673	.25	.28	10,600	
May	1,630	1,200	3,319	1.25	1.41	201,000	
June	3,230	1,060	2,326	.88	.98	138,000	
July	1,360	390	799	.3	.35	19,100	
August	660	300	391	.15	.17	21,000	
September	360	195	214	.09	.10	15,000	
October	130	215	306	.11	.12	18,200	
November	330	155	226	0.08	0.09	13,900	
December							
The period							

NOTE.—Accuracy, "B" and "C."

Discharge Measurements of Nicola River, near Merritt, 1911-12.

Date	Hydrographer	Meter No.	Width	Area of section	Mean velocity	Gauge height	Discharge
1911			Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
July 11	C. E. Richardson	1048	78	262	2.7	6.24	715
Aug. 9	"	1048	70	308	1.6	5.50	[illegible]
Sept. 18	"	1048	68	180	1.4	5.27	[illegible]
Oct. 27	"	1048	50	153	0.5	4.75	75
1912							
May 2	"	1048	[illegible]	70	[illegible]	6.02	640
May 25	C. G. Cline	1046	115	471	4.4	7.42	2 090
July 4	B. Cogbould	1041	56	288	[illegible]	6.31	700
July 23	"	1041	51	[illegible]	1.4	5.59	374
Aug. 13	"	1041	46	202	0.9	5.02	192

DAILY GAUGE HEIGHT AND DISCHARGE of Nicola River, near Merritt, for 1911.

Day.	June. Gauge height.	June. Discharge	July. Gauge height.	July. Discharge	August. Gauge height.	August. Discharge	September. Gauge height.	September. Discharge	October. Gauge height.	October. Discharge	November. Gauge height	November. Discharge	December. Gauge height	December. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft	Feet	Sec.-ft.	Feet	Sec.-ft
1			6·65	1,060	5·5	350	5·05	175	4·95	145	4·65	60	4·9	130
2			6·6	1,020	5·55	370	5·05	175	4·95	145	4·65	60	4·85	115
3			6·55	980	5·5	350	5·1	190	4·9	130	4·7	70	4·8	100
4			6·5	940	5·5	350	5·15	210	4·9	130	4·7	70	4·8	100
5			6·5	940	5·5	350	5·2	230	4·85	115	4·7	70	4·8	100
6			6·55	980	5·55	370	5·2	230	4·85	115	4·7	70	4·8	100
7			6·5	940	5·6	390	5·15	210	4·8	100	4·7	70	4·75	85
8			6·4	870	5·6	390	5·15	210	4·8	100	4·65	60	4·75	85
9			6·3	800	5·5	350	5·1	190	4·8	100	4·65	60	4·7	70
10			6·3	800	5·45	330	5·05	175	4·75	85	4·6	50	4·75	85
11			6·2	730	5·4	310	5·0	160	4·75	85	4·6	59	4·75	85
12			6·2	730	5·4	310	5·0	160	4·75	85	4·6	50	4·75	85
13			6·2	730	5·35	290	5·05	175	4·7	70	4·55	40	4·75	85
14			6·2	730	5·3	270	5·05	175	4·7	70	4·55	40	4·75	85
15			6·2	730	5·3	270	5·0	160	4·7	70	4·55	40	4·75	85
16			6·2	730	5·3	270	5·0	160	4·7	70	4·65	60	4·75	85
17			6·15	695	5·3	270	5·1	190	4·7	70	4·7	70	4·75	85
18			6·1	660	5·25	250	5·3	270	4·75	85	4·8	100	4·75	85
19	6·9	1,290	6·05	630	5·2	230	5·2	230	4·75	85	4·9	130	4·75	85
20	6·8	1,190	6·0	600	5·2	230	5·1	190	4·75	85	4·9	130	4·7	70
21	6·8	1,190	5·9	540	5·2	230	5·15	210	4·8	100	5·0	160	4·75	85
22	6·8	1,190	5·8	480	5·2	230	5·1	190	4·8	100	5·0	160	4·8	100
23	6·7	1,100	5·8	480	5·2	230	5·0	160	4·8	100	4·95	145	4·9	130
24	6·7	1,100	5·75	455	5·2	230	5·05	175	4·8	100	4·95	145	4·8	100
25	6·7	1,100	5·7	430	5·15	210	5·05	175	4·8	100	4·9	130	4·65	60
26	6·8	1,190	5·7	430	5·15	210	5·0	160	4·75	85	4·85	115	4·65	60
27	6·75	1,145	5·65	410	5·1	190	5·0	160	4·75	85	4·8	100	4·65	60
28	6·7	1,100	5·6	390	5·1	190	4·95	145	4·75	85	4·7	70	4·65	60
29	6·6	1,020	5·55	370	5·1	190	4·95	145	4·7	70	4·75	85	4·65	60
30	6·7	1,100	5·5	350	5·1	190	4·95	145	4·7	70	4·8	100	4·65	60
31			5·5	350	5·1	190			4·65	60			4·65	60

MONTHLY DISCHARGE of Nicola River, near Merritt, for 1911.

(Drainage area, 1,500 square miles.)

Month.	Discharge in Second Feet				Run Off		Rainfall
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
July	1,060	350	677	45	5	41,600	
August	300	150	277	18	21	17,000	
September	270	115	184	12	13	10,900	
October	115	60	93.4	06	07	5,740	
November	160	40	85.3	06	·07	5,070	
December	130	60	85.2	06	·07	5,240	
The period							11

NOTE.—Accuracy, "B"

GAUGE HEIGHTS AND DAILY DISCHARGE of

Day	January Gauge height	January Discharge	February Gauge height	February Discharge	March Gauge height	March Discharge	April Gauge height	April Discharge	May Gauge height	May Discharge	June Gauge height	June Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	4.65	60	5.05	175	5.0	160	5.2	230	6.0	600	7.15	1,585
2	4.65	60	5.0	160	5.0	160	5.3	270	6.05	630	7.15	1,585
3	4.65	60	5.0	160	5.2	230	5.3	270	6.15	695	7.1	1,520
4	4.65	60	4.95	145	5.15	210	5.35	290	6.2	730	7.1	1,520
5	4.65	60	4.95	145	4.95	145	5.35	290	6.3	800	7.1	1,520
6	4.65	60	5.0	160	4.9	130	5.4	310	6.4	870	7.15	1,585
7	4.65	60	5.05	175	5.0	160	5.4	310	6.5	940	7.1	1,520
8	4.65	60	5.1	190	5.0	160	5.4	310	6.8	1,190	7.1	1,520
9	4.65	60	5.05	175	5.0	160	5.4	310	7.2	1,650	7.1	1,520
10	4.65	60	5.0	160	5.0	160	5.45	330	7.0	1,400	7.05	1,460
11	4.75	85	5.0	160	4.95	145	5.55	370	7.0	1,400	7.05	1,460
12	4.9	130	5.0	160	4.95	145	5.55	370	7.05	1,460	7.05	1,460
13	5.1	190	5.0	160	4.95	145	5.55	370	7.25	1,725	7.0	1,400
14	5.4	310	5.0	160	4.9	130	5.55	370	7.2	1,650	6.95	1,270
15	5.3	270	5.05	175	4.9	130	5.55	370	7.15	1,585	6.86	1,210
16	5.15	210	5.1	190	4.9	130	5.55	370	7.1	1,520	6.75	1,115
17	4.95	145	5.05	175	4.9	130	5.6	390	7.05	1,460	6.8	1,190
18	4.85	115	5.05	175	4.9	130	5.6	390	7.0	1,400	6.8	1,190
19	4.85	115	5.05	175	4.9	130	5.6	390	7.0	1,400	6.8	1,190
20	4.8	100	5.05	175	4.9	130	5.6	390	7.4	1,864	6.85	1,210
21	4.8	100	5.05	175	4.9	130	5.6	390	7.75	2,580	6.8	1,190
22	4.85	115	5.05	175	4.95	145	5.6	390	7.4	1,960	6.7	1,100
23	4.9	130	5.1	190	4.95	145	5.6	390	7.3	1,800	6.65	1,060
24	5.0	160	5.05	175	5.0	160	5.65	410	7.35	1,880	6.6	1,020
25	5.05	175	5.0	160	5.0	160	5.65	410	7.4	1,960	6.5	940
26	4.95	145	5.0	160	5.0	160	5.7	430	7.45	2,045	6.45	[illegible]
27	4.95	145	5.0	160	5.05	175	5.7	430	7.5	2,130	6.4	870
28	4.95	145	5.0	160	5.1	190	5.75	455	7.45	2,045	6.35	835
29	5.1	190	..	190	5.1	190	5.85	510	7.3	1,800	6.3	800
30	5.05	175	....		5.1	190	5.9	540	7.25	1,725	6.3	800
31	5.05	175	....		5.15	210			7.15	1,585		

Nicola River, near Merritt, for 1912.

July		August		September		October		November		December		Day
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	
6.3	800	5.15	210		110		40	4.6	50	4.85	115	1
6.4	870		210	4.9	150	4.75	90		50		130	2
6.3	800	5.15	210		130		40	4.6	50	4.95	145	3
6.2	730		200	4.9	130	4.55	40		50		140	4
6.2	730	5.1	190		130		18	4.6	50	4.7	70	5
6.15	695		180	4.9	130	4.6	30		55		60	6
6.1	660	5.05	175		115		30	4.65	60	4.6	50	7
6.05	630		175	5.0	160	4.6	30		55		50	8
6.05	630	5.05	175		115		35	4.6	50	4.6	50	9
6.05	630		185	4.9	150	4.65	60		55		50	10
6.1	660	5.1	190		115		60	4.65	60	4.6	50	11
6.05	630		175	4.8	100	4.65	60		80		50	12
6.05	630	5.0	160		90		60	4.8	100	4.6	50	13
6.0	600		160	4.75	85	4.65	60		100		55	14
	570	5.0	160		80		65	4.8	100	4.65	60	15
5.9	540		185	4.7	70	4.7	70		100		60	16
	500	5.15	210		60		70	4.8	100	4.65	50	17
5.75	455		200	4.6	50	4.7	70		130		70	18
	420	5.1	190		45		90	5.0	160	4.75	85	19
5.6	390		190	4.55	40	4.85	115		150		80	20
	370	5.1	190		45		90	4.95	145	4.7	70	21
5.5	350		170	4.6	50	4.7	70		140		65	22
5.5	350	4.95	145		50		70	4.9	130	4.65	60	23
	340		140	4.6	50	4.7	70		130		55	24
	340	4.9	130		50		70	4.9	130	4.6	50	25
5.45	330		120	4.6	50	4.7	70		120		50	26
	300	4.85	115		45		65	4.85	115	4.6	50	27
5.3	270		110	4.55	40	4.65	60		115		50	28
	250	4.8	100		40		60	4.85	115	4.5	50	29
5.2	230		90	4.55	40	4.65	60		115		50	30
	220	4.75	85				55			4.6	50	31

MONTHLY DISCHARGE of Nicola River, near Merritt, for 1912.

(Drainage area, 1,500 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain Fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
January	310	60	127	·08	·09	7,810	
February	190	145	169	·11	·12	9,720	
March	230	130	157	·10	·11	9,650	
April	540	230	368	·24	·27	21,900	
May	2,580	600	1,502	1·0	1·15	92,200	
June	1,585	800	1,257	·84	·94	75,000	
July	870	220	514	·34	·39	31,600	
August	210	85	165	·11	·13	10,100	
September	160	40	84·5	·06	·07	5,030	
October	115	40	62·4	·04	·05	3,840	
November	160	50	95·3	·06	·07	5,670	
December	145	50	66·1	·04	·05	4,060	
The year	2,580	40	380	·25	3·44	276,580	13

NOTE.—Accuracy, "B."

NIKAIA CREEK (134).

Nikaia creek has its source in the Cantilever mountains, at an elevation of 3,000 feet, and discharges into the Fraser river, near Lytton, at an elevation of 590 feet. The precipitation is small, not exceeding 20 inches; the summers are dry and very hot, and the winters are not severe, with 3 feet or 4 feet of snow. Nikaia creek is about 7 miles long and from 5 to 10 feet wide. Its drainage area is 7 square miles. Its depth varies from 0·5 feet to 2 feet. The valley is small and rough, with no agricultural land excepting near the mouth, where some 50 acres are taken up. This land is irrigated from the creek.

The mean flow of Nikaia creek is about 5 second-feet, and its maximum probably about 50 second-feet.

A station was established on Nikaia creek on September 23, 1911, by C. F. Richardson, and was located half a mile from the creek's mouth, below the bridge on which the trail crosses. The creek runs between high banks, and is confined to one channel. The gauge is a standard vertical staff gauge, 5 feet long, and is located on the right bank of the stream, 15 feet above the bridge. The stream was not considered of sufficient importance to warrant the continuance of gauge readings. Three meter measurements were made at different stages of the stream. (*See* miscellaneous measurements on Nikaia creek.)

NISKONLITH CREEK (249).

Niskonlith creek is a stream about 10 miles in length, 4 to 10 feet in width and varies from a few inches to two feet in depth. Its drainage area is 50 square miles. Its source is in the hills of township 22, range 14, west of the 6th meridian, the northern slope of which feeds McGillvary creek, an important tributary of Louis creek. Niskonlith creek is little known and is, as yet, unused above Niskonlith lake, an ideal storage reservoir, two miles from South Thompson river, at an elevation of 1,620 feet. The Indians of the Niskonlith reserve are the principal users, and the flow is well regulated by a dam installed by the Indian Department. It is capable of raising the level of Niskonlith lake, whose area is 1,000 acres, 8 feet, thus impounding 8,000 acre-feet which is, however, much in excess of the normal run-off of the stream. Since the lake was dammed and its level raised, damage is done to hay land in lot 836, by seepage. The normal precipitation in the Niskonlith watershed is about 15 to 20 inches per annum.

There is sufficient water in Niskonlith creek for all users, and suggestion has been made that some of it might be applied to land in the Pemberton and Moulton creek valleys.

A drop of over 500 feet in 2 miles between Niskonlith lake and the South Thompson indicated the possibility of a small power development. The mean flow, however, is very small, but it might be augmented by diversion from a tributary of Adams lake.

The station was established on August 26, 1911, by C. G. Cline, and semi-weekly gauge readings taken during the remainder of 1911 and the whole of the 1912 irrigation season. The station is located about half mile above the highway along South Thompson river and half a mile below Niskolith lake; it is also half mile below the intake for the Indian Reserve irrigation ditch. The gauge is a 3-foot standard gauge, nailed to an 8-inch birch on the right bank of the stream. It is nearly opposite an old deserted cabin which stands on the flat. Measurements are made by wading. The banks are 3 to 5 feet in height, and the stream is confined to one channel which varies in depth from a few inches to two feet. There are three bench-marks, whose elevations are referred to the datum of the gauge.

DISCHARGE MEASUREMENTS of Niskonlith Creek, at mouth, 1911-12.

Date.	Hydrographer.	Meter No	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Aug. 28..	C. G. Cline	1,046	10·0	9·2	0·50	0·66	4·4
1912.							
April 17.	E. M. Dann, C. G. Cline	1,046	1·0	0·15	0·60	0·30	0·1
May 20.	E. M. Dann..	1,014	8·0	17·9	3·7	1·92	66·9

GAUGE HEIGHT AND DISCHARGE of Niskonlith Creek, at mouth, for 1911.

Day	August. Gauge height	August. Discharge	September. Gauge height	September. Discharge	October. Gauge height	October. Discharge	November. Gauge height	November. Discharge	December. Gauge height	December. Discharge
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.
1				4·2	0·6	3·0		5·3		
2			0·65	4·2		2·9	0·7	5·3	0·67	4·6
3				4·2		2·8		5·3		
4				4·2		2·7		5·3		
5			0·65	4·2	0·57	2·6	0·7	5·3		
6				4·0		2·5		5·0		
7				3·8		2·2		4·8		
8				3·7		2·0		4·5		
9				3·6	0·52	1·7	0·65	4·2		
10			0·62	3·5		4·8		3·8		
11				3·5		1·9		3·4		
12			0·62	3·5		2·0	0·6	3·0		
13			0·62	3·4	0·55	2·2		2·9		
14				3·3		2·2		2·8		
15				3·2	0·55	2·2		2·7		
16				3·1		3·0		2·6		
17			0·6	3·0		3·8	0·57	2·5		
18				3·0		1·6		2·0		
19				3·0		5·3	0·62	3·5		
20			0·6	3·0		6·0		4·1		
21				3·0	0·75	6·[illegible]		4·7		
22				3·0	0·75	6·7	0·7	5·3		
23				3·0		6·2		5·3		
24			0·6	3·0		5·9		5·3		
25				3·0		5·6	0·7	5·3		
26				3·0	0·7	5·3		5·3		
27				3·0		5·3		5·3		
28	0·65	1·2	0·6	3·0		5·3		5·3		
29				3·0	0·7	5·3		5·3		
30				3·0		5·3	0·7	5·3		
31						5·3				

MONTHLY DISCHARGE of Niskonlith Creek, at mouth, for 1911.

(Drainage area, 50 square miles.)

Month.	Discharge in Second-Feet. Maximum	Minimum	Mean.	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet.	Rain Fall. Inches.
September	4·2	3·0	3·4	0·07	0·08	202	
October	6·7	1·7	3·9	0·08	0·09	240	
November	5·3	2·5	4·4	0·09	0·10	262	
The period							12

NOTE.—Station was established August 28, artificial control.
Accuracy "B."

Gauge Height and Discharge of Niskonlith Creek, at mouth, for 1912.

Day	April Gauge height	April Discharge	May Gauge height	May Discharge	June Gauge height	June Discharge	July Gauge height	July Discharge	August Gauge height	August Discharge	September Gauge height	September Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1		15.0		52		69	1.05	18	0	0.3		0.6
2	1.0	15.0		18	1.9	66		18	0.3	0.1		0.6
3		15.0	1.55	44		66		18		0.5		0.6
4		15.0		47		66	1.05	18		1.0		0.6
5		15.0	1.65	50		66		18		1.4	0.42	0.6
6	1.0	15.0		52	1.9	66		18		1.8		0.7
7		15.0		54		64	1.05	18		2.2		0.8
8		15.0		56		62		5.3		2.6		0.8
9	1.0	15.0		58		59		5.3	0.6	3.0	0.45	0.9
10	Dam closed	7.5	1.8	59		56		5.3		3.0		0.9
11		0.1		60		53	0.7	5.3	0.25	0.3		0.9
12	0.3	0.1		62		50		4.3		0.5		0.9
13		0.1		64	1.6	47		3.3		0.7	0.15	0.9
14		0.1	1.9	66		16		2.3		0.8		
15		0.1		67	1.55	41		1.3	0.15	0.9		
16	0.3	0.1		68		41		0.3		1.0		
17		0.1		69		43	0.25	0.3		1.2		
18		0.1	1.95	70		42		0.3	0.5	1.4		
19	0.3	0.1		78		12		0.3		1.3		
20		0.1	1.92	67	1.5	11	0.37	0.3		1.2		
21	0.3	0.1	1.95	70		11		0.3		1.1		
22		0.1		71	1.5	11		0.4		1.0		
23		0.1		72		31		0.4	0.15	0.9		
24		0.1		74		21	0.4	0.4		0.8		
25	0.8	8.1	2.05	76	0.9	11.5		0.1		0.6		
26		27.0		76		18		0.1	0.1	0.4		
27		56.0		76	1.2	21	0.1	0.1		0.4		
28	1.9	66.0	2.05	76		22		0.4		0.5		
29		61.0		76		20	0.4	0.1		0.5		
30		56.0	2.05	76		19		0.4	0.42	0.6		
31				72				0.4		0.6		

Monthly Discharge of Niskonlith Creek, at mouth, for 1912.

(Drainage area, 50 square miles.)

Month	Discharge in Second-Feet Maximum	Minimum	Mean	Per square mile	Run-Off Depth in inches on Drainage area	Total in acre-feet	Rain-fall Inches
April	66	0.1	14.0	0.28	0.31	850	
May	76	41	64.1	1.3	1.5	3,960	
June	69	11.5	44.7	0.89	0.99	2,660	
July	18	0.3	5.3	0.11	0.13	326	
August	3	0.1	1.0	.20	0.23	61	
The period							11

Note.—Artificial control by dam on lake. This station was maintained during the irrigation season only, the flow during the remainder of the year is important only for domestic purposes, being of little value for storage. Winter conditions exist during December, January and February.

Accuracy, "B."

No. 2 Creek (420).

No. 2 creek has its source in the Selkirk mountains, at an elevation of from 6,000 to 9,000 feet, and discharges into Upper Columbia river 9 miles below lake Windermere, at an elevation of 2,700 feet. It is part of the Upper Columbia drainage; the drainage area is at present indeterminate, as there are no reliable maps of the vicinity. It is probably about 150 square miles. The headwaters of the creek have an annual precipitation of about 60 inches, principally snow. Toward the mouth, the creek passes through the arid Windermere district, where the precipitation is about 15 inches annually, and the winter conditions very severe.

From the mouth of the creek to the lower wagon road (1½ miles) the stream flows through the bottom lands of the Columbia valley, which are flooded at high water in June and July. Above the crossing the creek runs through a box canyon half mile long, 30 feet wide and 150 feet deep, in which there is a fall of 50 feet. At the head of the canyon there is a direct fall of 135 feet (measured by aneroid). The banks at the head of the canyon are of solid rock, 80 feet high and 30 feet wide. Above the falls the canyon continues for about a mile, when the country opens out a little. Two miles above the head of the canyon the creek forks, No. 3 creek coming in from the north. No. 3 creek carries more water than the main creek above the forks. It flows through a rolling country, mostly timbered, but in which several ranchers have settled. No. 2 creek, above the fork, flows through a rough mountainous country for 6 miles.

Irrigation is practised in the Columbia valley, and the water of No. 2 creek can be used for this purpose. Mr. Forster, a large landowner in the district, built a dam. 80 feet high, at the head of the falls in order to raise water to some of his bench lands. When the water reached the desired height, the dam failed. He is now constructing an irrigation flume with the intake on No. 2 creek, about 2 miles above the forks.

A water-power development is practicable on this stream. The flow is more uniform than on other streams in this vicinity. The maximum for 1912 occurred during the latter part of June, and was 1,110 c.f.s. The mean flow from June to the end of October was 500 c.f.s. The estimated minimum flow in the latter part of February is 50 c.f.s. By constructing a dam at the head of the falls a head of 250 feet could be obtained. There is no good natural storage reservoir on the stream, although the suggested dam would give good pondage and forebay.

The hydrographic station on No. 2 creek is situated at the highway bridge on the road from Athalmer, about 1½ miles from the mouth. The gauge is a vertical staff gauge, 7 feet long, and is fastened to the abutment on the lower right hand side. The gauge is graduated in feet and tenths. Bench-marks were established and referred to the zero of the gauge. The gauge was read daily by a neighbouring rancher. Measurements were made at the upper side of the bridge. The section was not very good, owing to the swift water and uneven nature of the stony creek bed.

Discharge Measurements of No. 2 Creek, at highway bridge, near Forster's ranch, 1912.

Date	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft
May 29	H. C. Hughes	1055	32	64	4·9	0·81	314
June 13	"	1055	53	112	6·6	1·70	711
July 3	"	1055	51	111	6·0	1·68	689
July 24	"	1055	57	116	6·4	1·70	745
Sept. 28	C. E. Richardson	1055	32	43	4·7	0·40	203

Daily Gauge Height and Discharge of No. 2 Creek, at highway bridge near Forster's ranch, for 1912.

Day.	May.		June		July.		August		September		October		November	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge
	Feet	Sec.-ft	Feet	Sec.-ft	Feet	Sec.-ft	Feet	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·6	240	1·6	670		805	0·8	300		240	0·3	190
2			0·6	210	1·8	805	1·8	805	1·0	370		215	0·3	190
3			0·55	230	1·65	700	1·7	735	0·85	320	0·3	190		
4				275	1·6	670	1·9	875	1·0	370	0·4	205		
5			0·6	240	1·7	735	1·7	735	0·8	300	0·3	190		
6			0·6	240	1·7	735	1·5	610	0·8	300		190		
7			0·8	300		735		610	0·6	240	0·3	190		
8			1·0	370	1·7	735	1·5	610		270	0·4	205		
9			1·2	455	1·6	670	1·7	735	0·8	300	0·3	190		
10			1·35	530	1·65	700	1·6	670	1·0	370		190		
11			1·35	530	1·7	735	1·5	610	0·9	335		190		
12			1·4	555	1·7	735	1·3	505	0·9	335	0·3	190		
13			1·7	735	2·0	950	1·3	505	0·8	300		185		
14				680	1·8	805	1·1	410	0·8	300	0·2	175		
15			1·5	610	1·8	805	1·9	875		270	0·3	190		
16			1·3	505	1·8	805	1·9	875	0·6	240	0·3	190		
17			1·5	610	1·5	610	1·3	505	0·6	240	0·5	220		
18			1·7	735	1·6	670	1·2	455	0·8	300	0·3	190		
19			1·9	875	1·6	670	1·1	410		275		190		
20			2·0	950	1·7	735	1·0	370	0·65	255		175		
21			1·9	875	1·8	805	1·0	370		240	0·2	175		
22			2·0	950	1·7	735	1·4	555	0·5	220	0·3	190		
23			2·1	1,030	1·8	805	1·4	555	0·55	230	0·3	190		
24			2·2	1,110	1·65	700	2·0	976	0·6	240	0·3	190		
25			2·2	1,110	1·6	670	1·8	805		230	0·4	205		
26			2·2	1,110	1·7	735	1·7	735	0·5	220	0·4	215		
27			2·2	1,110	1·6	670	1·7	735	0·3	190	0·3	190		
28			1·8	805	1·5	610	1·3	505	0·4	205	0·3	190		
29			1·6	670	1·7	735		430	0·2	175	0·3	190		
30	0·8	300	1·7	735	1·7	735	1·0	370	0·5	220	0·3	190		
31	0·7	270			1·8	895	0·7	270			0·3	190		

MONTHLY DISCHARGE of No. 2 Creek, Highway Bridge, near Forster's ranch for 191

Month	Discharge in Second Feet				Run-Off		
	Maximum	Minimum	Mean	Per sq. mile	Depth in inches on Drainage Area	Total in acre-feet	
June	1,140	230	646			38,400	
July	950	610	732			45,000	
August	950	270	611			37,600	
September	370	175	272			16,200	
October	240	175	191			11,900	
The period							

NOTE.—Station established May 30, 1912. Stream frozen over early in November, 1912. N creek is much more steady in its flow than the other tributaries of the Columbia in this vicinity. estimated minimum flow in the month of March is 50 c.f.
Accuracy "B."

OREGON JACK CREEK (208).

Oregon Jack creek rises north of the headquarters of Hat creek, at an elevat of 4,000 feet, and discharges into the Thompson river 7 miles below Ashcroft, at elevation of 980 feet. It is part of the Thompson drainage. The natural area of its watershed is 31 square miles, but in 1912 water was run into Oregon Jack creek fr Hat creek, thus practically increasing the watershed area. The water is used for irrigation. The stream is in the Dry Belt, with a mean annual precipitation of from to 10 inches. It is dry and hot in the summer, and cold and dry in the winter. S bushes and prickly pears grow in the lower altitudes.

A ditch and flume line has been constructed to divert water from Upper Hat cre into a storage reservoir in the pass between Oregon Jack creek and Hat creek. T is a good site for a large reservoir there, though a big earth dam would be requir There is only a small dam at present. The conflicting applications for the use of site have interfered with its proper development. From the reservoir the water is as required into Oregon Jack creek and follows the natural bed of the stream several miles. There is a small diversion about 5 miles from the mouth of the c which takes the water over to some lands on Minnaberriet creek. The main s however, is used on Basque ranch, on the bank of the Thompson river. Even wi diversion from Hat creek, as managed at present, there is not sufficient water; supply of water were larger there is a great deal of land in the vicinity which be irrigated from Oregon Jack creek.

A gauging station was established on the stream, about a mile from the m and just above the main diversion for the Basque ranch. This station measure natural flow of the stream, together with the water which is diverted from Hat There is a diversion 5 miles up the stream and, when the water is being tak there, it should be added to the flow at the station to give the total flow. Gaug ings have been taken from April to September, 1912. The gauge is a 5 foot v staff, nailed to a tree on the right bank, about 200 feet above the diverting dar 150 yards below the bridge where the Yale-Cariboo wagon road crosses the st The meter measurements are made by wading.

DISCHARGE MEASUREMENTS of Oregon Jack Creek, above Hammond's diversion, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Oct. 2	Cline and Smith	1016	6·0	2·2	0·9	0·88	2·0
1912.							
May 7	C. G. Cline	1016	7·0	2·65	1·3	1·00	3·6
May 12	"	1016	7·0	2·2	1·7	1·08	5·4
June 20	Cline and Corbould	1016	7·0	4·6	1·7	1·10	7·1
July 9	B. Corbould	1014	7·5	5·5	2·5	1·29	13·6
July 29	"	1014	7·5	5·7	2·1	1·25	12·1
Aug. 16	"	1014	7·5	3·6	2·2	1·23	8·1

GAUGE HEIGHT AND DISCHARGE of Oregon Jack Creek, above Hammond's diversion, for 1911.

Day.	October. Gauge height.	October. Discharge.
	Feet.	Sec.-ft.
1		
2	0·9	2·2
3	0·9	2·2
4	0·9	2·2
5	0·9	2·2
6	0·9	2·2
7	0·9	2·2
8	0·9	2·2
9	0·9	2·2
10	0·9	2·2
11	0·9	2·2
12	0·9	2·2
13	0·9	2·2
14	0·9	2·2

DAILY GAUGE HEIGHT AND DISCHARGE of Oregon Jack Creek, above Hammond's diversion, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		2·2	0·9	2·2							1·15	7·6
2		2·2	0·9	2·2							1·15	7·6
3		2·2	0·9	2·2							1·15	7·6
4	0·9	2·2	0·9	2·2							1·15	7·6
5	0·9	2·2	0·9	2·2							1·15	7·6
6	0·9	2·2	0·9	2·2							1·1	5·8
7	0·9	2·2	1·0	3·5							1·1	5·8
8	0·9	2·2	1·0	3·5							1·05	4·6
9	0·9	2·2	1·0	3·5							1·05	4·6
10	0·9	2·2	1·1	5·8			1·1	5·8			1·0	3·5
11	0·9	2·2	1·1	5·8			1·2	9·5			1·0	3·5
12	0·9	2·2	1·1	5·8			1·2	9·5			0·95	2·8
13	0·9	2·2	1·1	5·8	1·1	5·8	1·1	5·8			0·95	2·8
14	0·9	2·2	1·1	5·8	1·1	5·8	1·1	5·8			0·9	2·2
15	0·9	2·2	1·1	5·8	1·1	5·8	1·1	5·8				
16	0·9	2·2	1·1	5·8	1·1	5·8	1·1	5·8				
17	0·9	2·2	1·1	5·8	1·1	5·8						
18	0·9	2·2	1·1	5·8	1·1	5·8			1·25	11·8		
19	0·9	2·2	1·1	5·8	1·1	5·8			1·25	11·8		
20	0·9	2·2	1·1	5·8	1·1	5·8			1·25	11·8		
21	0·9	2·2	1·1	5·8	1·2	9·5			1·25	11·8		
22	0·9	2·2	1·1	5·8	1·3	14·0			1·25	11·8		
23	0·9	2·2		5·8	1·1	5·8			1·25	11·8		
24	0·9	2·2		5·8	0·9	2·2			1·25	11·8		
25	0·9	2·2		5·8	0·9	2·2			1·2	9·5		
26	0·9	2·2		5·8	0·9	2·2			1·2	9·5		
27	0·9	2·2		5·8					1·2	9·5		
28	0·9	2·2		5·8					1·2	9·5		
29	0·9	2·2		5·8					1·2	9·5		
30	0·9	2·2		5·8					1·2	9·5		
31				5·8					1·2	9·5		

MONTHLY DISCHARGE of Oregon Jack Creek, above Hammond's diversion, for 1912.

(Drainage area, 6 square miles.)

Month.	Discharge in Second Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	2·2	2·2	2·2	0·4	0·46	131	
May	5·8	2·2	4·9	0·8	0·9	301	
The period							9

NOTE.—Gauge readings during remainder of irrigation season not continuous.
Accuracy, "C" and "D."

OTTERTAIL RIVER (413).

Ottertail river has its source in the Ottertail range of the Rocky mountains, 9 miles southeast of Field, at an elevation of from 6,090 to 9,000 feet and, flowing in a northerly direction, discharges into Kicking Horse river, 6 miles west of Field, at an elevation of 3,700 feet. It is part of the Kicking Horse-Columbia drainage, the drainage area, as measured from a Dominion sectional map, scale 3 miles to an inch, is 90 square miles. The precipitation varies from 40 to 60 inches, of which about 40 per cent is snowfall; the winter conditions are very severe. The Ottertail is about 15 miles long, 35 feet wide, and from 2 to 5 feet deep. There are no decided falls on the stream, but a series of rapids and falls, 3 to 4 feet in height, constitutes an average drop of 40 feet to the mile. The stream is very swift, and flows over a rocky bed. The valley, generally, is very steep and narrow, and is heavily timbered.

At present there are no active interests on the stream. Logging may be successfully carried on during June, July and August, and as there is a considerable amount of good timber up the valley, this interest will doubtless be developed. There are also several mining claims, which may be worked to good advantage. The power possibilities are limited to small powers.

The river station on the Ottertail was established June 6, 1912, by C. E. Richardson. The measuring section is located 200 yards above the highway bridge (the old C.P.R. grade) between Field and Ottertail, about 1 mile from the mouth; measurements are made from a temporary foot-bridge with a meter suspended by a wading rod. A standard vertical staff gauge is fastened to the downstream side of a pile on the left bank of the stream, under the above-mentioned highway bridge; its datum is referred to three bench-marks. The section is very satisfactory; there is good control, a swift uniform current, high banks, and one channel, with a permanent rocky bed.

DISCHARGE MEASUREMENTS of Ottertail River, near Field, B.C., 1912.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 6	C. E. Richardson	1048	28	62	2·2	2·72	138
June 28	"	1048	33	104	6·3	3·60	650
Aug. 12	"	1048	29	91	4·5	3·25	408

DAILY GAUGE HEIGHT AND DISCHARGE of Ottertail River near Field, for 1912.

Day	June Gauge height.	June Discharge	July Gauge height	July Discharge	August Gauge height	August Discharge	September Gauge height	September Discharge	October Gauge height	October Discharge	November Gauge height.	November Discharge
	Feet.	Sec.-ft	Feet	Sec.-ft	Feet.	Sec.-ft	Feet	Sec.-ft	Feet	Sec.-ft	Feet	Sec.-ft
1	Mean	100	2·35	475	3·45	512	3·3	442	2·75	151	2·4	58
2			3·5	577	3·35	475	3·25	410	2·75	151	2·3	42
3			3·25	410	3·25	475	3·35	475	2·75	151	2·5	77
4			3·3	442	3·4	508	3·2	379	2·8	172	2·5	77
5			3·4	508	3·4	508	3·2	379	2·75	151	2·5	77
6	2·75	151	3·35	475	3·35	475	3·25	410	2·75	151	2·5	77
7	3·15	350	3·5	577	3·25	410	3·17	362	2·75	151	2·5	77
8	3·35	475	3·45	542	3·35	475	3·2	379	2·75	151	2·5	77
9	3·3	442	3·55	644	3·35	475	3·15	350	2·75	151	2·45	68
10	3·3	442	3·5	577	3·35	475	3·17	362	2·7	130		
11	3·5	577	3·55	644	3·3	442	3·15	350	2·7	130		
12	3·5	577	3·5	577	3·25	410	3·15	350	2·7	130		
13	3·75	761	3·6	650	3·25	410	3·1	321	2·7	130		
14	3·5	577	3·55	614	3·25	410	3·05	294	2·7	130		
15	3·55	614	3·55	614	3·3	442	3·02	278	2·65	115		
16	3·55	614	3·55	614	3·25	410	3·02	278	2·7	130		
17	3·6	650	3·45	512	3·45	512	3·0	267	2·75	151		
18	3·75	764	3·4	508	3·25	410	3·02	278	2·7	130		
19	3·85	841	3·45	542	3·4	508	3·0	267	2·7	130		
20	3·9	880	3·45	542	3·4	508	2·92	228	2·65	115		
21	3·8	802	3·35	475	3·35	475	2·92	228	2·65	115		
22	3·85	841	3·4	508	3·4	508	2·9	218	2·65	115		
23	3·85	841	3·35	475	3·4	508	2·87	204	2·65	115		
24	3·75	764	3·4	508	4·0	960	2·8	172	2·6	100		
25	3·7	725	2·35	475	3·85	841	2·87	204	2·6	100		
26	3·75	734	3·35	475	3·6	650	2·82	181	2·6	100		
27	3·5	577	3·3	442	3·55	614	2·8	172	2·6	100		
28	3·65	688	3·3	442	3·5	577	2·8	172	2·5	77		
29	3·45	544	3·3	442	3·45	542	2·77	160		60		
30	3·4	508	3·35	475	3·35	475	2·75	151	2·3	42		
31			3·4	508	3·3	442			2·3	42		

MONTHLY DISCHARGE of Ottertail River, near Field, for 1912.

(Drainage area, 90 square miles.)

Month.	Discharge in Second Feet. Maximum	Minimum	Mean.	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet
June	880	100	542	6·0	6·7	32,3[illegible]
July	650	410	524	5·8	6·7	32,2[illegible]
August	960	410	513	5·7	6·6	31,5[illegible]
September	475	151	291	3·2	3·6	17,[illegible]
October	151	42	121	1·3	1·5	7,4[illegible]

NOTE.—At 5 p.m. on August 24, discharge was 1,120 c.f.s. Winter conditions set in early in Noven[illegible]
Accuracy, "B."

Paul Creek.

Paul creek has its source in township 20-14-6, at an elevation of 3,500 feet and, flowing in a westerly direction, discharges into North Thompson river, near Kamloops, at an elevation of 1,140 feet. It is part of the North Thompson drainage; the drainage area, as measured from a Geological Survey map, dated 1895, scale 2 miles to an inch, is 140 square miles; of this area, 65 square miles is above the outlet of Paul lake. The precipitation varies from 25 inches in the hills at the source, to 10 inches at the mouth. Paul creek is a contentious irrigation stream, about 20 miles in length, varying from 5 to 25 feet in width and from several inches to a foot in depth. The drainage basin of Paul creek is well timbered with British Columbia fir, and, in the upper reaches, spruce and balm of Gilead are to be found. The first record on the stream is held by the Indians of the Kamloops Indian Reserve, and it is regrettable that this somewhat large share of the supply is not used to better advantage. Often, at the height of the irrigation season, the Indians' ditch may be seen discharging into the Thompson, while their fertile land lies idle awaiting the water so necessary for successful production.

The surplus flow of the stream, after the Indians are supplied, is held by the Harper estate, 12 miles east of Kamloops, on South Thompson river. A dam has been built, with the co-operation of the Indians, on Paul lake, for storage purposes, and is effective in impounding a good portion of the spring run-off. The dam could, however, be much improved, and the whole run-off successfully stored.

In its upper reaches, Paul creek flows through several large marshes and hay meadows, which flood in the spring time. It has been suggested that if the channel of Paul creek were deepened as it passes through these meadows and marshes, the evaporation would be materially decreased, and the flow of Paul creek augmented.

The residents of upper Paul creek (east of Pinantan lake) can raise good crops in average years without the aid of irrigation, although water, when judiciously applied, is of much assistance.

Below Paul lake (235). The station on Paul creek below Paul lake was established July 2, 1911, by C. G. Cline. The measuring section is in a flume just above the Harper Estate diversion. A standard vertical staff gauge is located on the right bank, 50 feet above the measuring section; all measurements are made by wading. This station was established to determine the flow from Paul lake.

Above Pinantan lake (231). This station was established August 25, 1911, by C. G. Cline, but was abandoned at the end of the irrigation season of 1912. This station was unsatisfactory, as the stream overflowed its banks during high water.

Below Pinantan lake (268). This station was established June 13, 1912, by E. M. Dann. The measuring section is located on the downstream side of the highway bridge, 100 feet below the outlet of Pinantan lake; all measurements are made by wading. A standard vertical staff gauge is located on the downstream side of the bridge. This station was established to take the place of the one abandoned (No. 231). Two measurements were taken in 1912. (*See* miscellaneous measurements on Paul creek.)

DISCHARGE MEASUREMENTS of Paul Creek, below Paul Lake, 1911-12.

Date	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911							
July 2	C. G. Cline	1046	5.7	1.71	8.71	1.95	14.9
August 29	"	1046	3.0	1.70	0.95	1.48	1.6
October 9	"	1046	1.0	0.88	0.98	1.10	0.9
1912							
April 15	C. G. Cline, E. M. Dann					1.2	0.0
June 3	E. M. Dann	1041	5.5	6.75	10.4	2.75	68
June 21	"	1041	5.5	5.55	7.86	2.46	43.6
August 4	H. J. E. Keys	1046	6.0	1.9	7.6	1.72	14.5

GAUGE HEIGHT AND DAILY DISCHARGE of Paul Creek, below Paul Lake, for 1911.

Day	August		September		October	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		2.8		1.1	1.1	0.8
2		2.8	1.45	1.1		0.8
3	1.55	2.8		1.1		0.8
4		2.7		1.1		0.8
5		2.6	1.45	1.1		0.8
6		2.5		1.3	1.1	0.8
7		2.4		1.2		
8		2.4		1.1		
9	1.52	2.3	1.42	1.0		
10		2.2		1.0		
11		2.0		1.0		
12	1.5	1.9	1.42	1.0		
13		1.9		1.0		
14	1.5	1.9		0.9		
15		1.9	1.41	0.9		
16		1.9		0.9		
17		1.8		0.8		
18	1.49	1.8		0.8		
19		1.8	1.4	0.8		
20		1.7		0.8		
21		1.6		0.8		
22	1.47	1.6	1.4	0.8		
23		1.6		0.8		
24		1.5		0.8		
25		1.5	1.1	0.8		
26	1.45	1.4		0.8		
27		1.4		0.8		
28		1.4		0.8		
29	1.45	1.4	1.4	0.8		
30		1.4		0.8		
31		1.4		……		

MONTHLY DISCHARGE of Paul Creek, below Paul Lake, for 1911.

(Drainage area, 65 square miles.)

Month	Discharge in Second-Feet.				Run-Off		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile	Depth in inches on Drainage area	Total in acre-feet	Inches
August	2·8	1·1	1·95	0·03	0·035	120	
September	1·4	0·8	0·9[illegible]	0·02	0·022	58	
The period							12

NOTE.—Station was established July [illegible]. Artificial control by storage dam on Paul lake. Accuracy "B."

GAUGE HEIGHT AND DAILY DISCHARGE of Paul Creek, below Paul Lake, for 1912.

Day	May		June		July		August		September	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				64		24		1[illegible]		9·4
2				[illegible]4		23		13		9·1
3			2·75	64		[illegible]2		13	1·61	9·1
4				61	1·91	20		13		8·8
5				64		20		13		8·5
6				64		20		12		8·2
7				61	1·91	20		12		7·9
8				64		20		12	1·76	7·
9				64		20	1·71	12		7·6
10				64		19		12		7·6
11				6[illegible]5		19		12		7·6
12		64		6[illegible]5		19	1·71	12		7·6
13		61		6[illegible]5		18		12		7·6
14		64		35	1·86	1[illegible]		12		7·6
15		64		35		1[illegible]		11		7·6
16		64		35		17		11		7·6
17		64		35		16		11		7·6
18		64	2·2[illegible]	35		16	1·[illegible]6	10·7		7·6
19		64		34		15		10·6	1·5[illegible]	7·6
20		64		[illegible]3		15		10·4		7·6
21		64	2·16	31	1·76	14		10·2		7·6
22		64		[illegible]0		14		10·0		7·6
23		64		30		14		9·9		7·6
24		64		[illegible]9		14		9·8		7·6
25		64		28		14		9·7	1·2	0·0
26		64		27		14		9·5		
27		64		[illegible]7		14		9·4		
28		64		26	1·[illegible]6	14		9·3		
29		64	2·06	26		14		9·2		
30		64		25		14	1·61	9·1		
31		64				14		9·4		

MONTHLY DISCHARGE of Paul Creek, below Paul Lake, for 1912.

(Drainage area, 65 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	64	0·0	41·3	0·64	0·74	2,540	
June	64	25	39·3	0·6	0·7	2,338	
July	24	14	17·2	0·26	0·30	1,058	
August	13	9·1	11·1	0·17	0·20	682	
September	9·1	0·0	6·3	0·10	0·11	375	
The period							15

NOTE. This stream is controlled by a dam at the outlet of Paul lake. The station is maintained during irrigation season only. During the late fall, the winter, and the early spring, the discharge of Paul creek is practically nil. Winter conditions exist on Paul creek during December, January and February.

Accuracy "B" and "C."

DISCHARGE MEASUREMENTS of Paul Creek, above Pinantan Lake, 1911-12.

Date.	Hydrographer.	Meter No	Width	Area of section.	Mean velocity	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
1911.							
Aug. 25	C. G. Cline	1046	3·5	1·24	0·16	1·03	0·2
1912.							
Apr. 16	E. M. Dann, C. G. Cline	1046	5·0	8·9	1·2	2·68	10·6
May 22	E. M. Dann	1044	10·0	9·7	2·2	3·60	21·8
June 11	"	1044	5·0	5·4	1·05	2·06	5·6
Aug. 12	H. J. E. Keys	105.	6·0	1·0	1·15	1·30	1·1*

*Different measuring section.

Daily Gauge Height and Discharge of Paul Creek, above Pinantan Lake, for 1911.

Day.	August.		September.		October.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·95	0·1		0·2
2			0·95	0·1	1·0	0·2
3			1·0	0·2	1·6	0·2
4			1·0	0·3	1·0	0·2
5			1·05	0·3	1·0	0·2
6			1·0	0·2	1·0	0·2
7			1·6	0·2	1·0	0·2
8			1·0	0·2	1·0	0·2
9			1·0	0·2	1·6	0·2
10			1·0	0·2	1·0	0·2
11			1·0	0·	1·0	0·2
12			1·0	0·2	1·0	0·2
13			1·05	0·3	1·0	0·2
14			1·05	0·3	1·9	0·2
15			1·0	0·2	1·0	0·2
16			1·0	0·2	1·0	0·2
17			1·0	0·	1·0	0·2
18			1·0	0·	1·0	0·2
19			1·0	0·2	1·0	0·2
20			1·0	0·2	1·0	0·2
21			1·0	0·2	1·0	0·2
22			1·0	0·2	1·0	0·2
23			1·0	0·2	1·0	0·2
24				0·2	1·0	0·2
25	1·0	0·2	1·0	0·2	1·0	0·2
26	1·0	0·2	1·0	0·2	1·0	0·2
27	1·0	0·2	1·0	0·2		
28	1·0	0·2	1·0	0·2		
29	1·05	0·2	1·0	0·2		
30	1·05	0·3	1·0	0·2		
31	1·0	0·2				

Monthly Discharge of Paul Creek, above Pinantan Lake, for 1911.

(Drainage area, 15 square miles.)

Month.	Discharge in Second Feet.				Run Off		Rainfall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
September	0·3	0·1	0·2	0·01	0·011	12	
October	0·2	0·2	0·2	0·01	0·012	12	
The period							12

Note.—Station was established August 25 and maintained until freeze-up which occurred October 26. Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of Paul Creek, above Pinantan Lake, for 191[illegible]

Day.	April. Gauge height.	April. Discharge.	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Discharge.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.	September. Gauge height.	September. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	2·8	11·5	3·7		3·0	13·5	1·8	3·9	1·3	1·1	1·3	1·1
2	2·8	11·5	3·7		2·8	11·5	1·8	3·9	1·3	1·1	1·4	1·6
3	2·9	12·5	3·7		2·7	10·7	1·8	3·9	1·3	1·1	1·1	1·6
4	3·1	14·6	3·7		2·6	9·9	1·8	3·9		1·1	1·3	1·1
5	3·1	14·6	3·7		2·5	9·1	1·9	4·6	1·3	1·1	1·3	1·1
6	3·3	17·1	3·8		2·4	8·3	1·9	4·6	1·3	1·1	1·2	[illegible]
7	3·5	20·2	3·8		2·4	8·3		4·6	1·2	0·7	1·4	1·6
8	3·8		3·8		2·3	7·5	1·9	4·6	1·2	0·7	1·1	1·6
9	3·5	20·2	3·8		2·2	6·7	1·9	4·6	1·1	1·6		1·4
10	2·8	11·5	3·8		2	6·0	1·8	3·9	1·3	1·1	1·3	1·1
11	2·7	10·7	3·8		9	5·3	1·8	3·9		1·1		1·1
12	2·6	9·9	3·8		0	5·3	1·8	3·9	1·3	1·1	1·3	1·1
13	2·7	10·7	3·8		2·0	5·3	1·7	3·3	1·3	1·1	1·2	0·7
14	2·4	8·3	3·7		2·0	5·3	1·7	3·3	1·3	1·1	1·2	0·7
15	2·7	10·7	3·7		2·3	7·5	1·6	2·7	1·25	0·9	1·3	1·1
16	2·7	10·7	3·7		2·4	8·3		2·1	1·3	1·1	1·2	0·7
17		10·7	3·7		2·3	7·5	1·5	2·1	1·3	1·1		0·7
18	2·7	10·7	3·7		2·3	7·5	1·5	2·1	1·3	1·3		0·7
19	2·5	9·1	3·6	21·8	2·2	6·7	1·5	2·1	1·3	1·1		0·7
20	2·7	10·7	3·6	21·8	2·1	6·0	1·4	1·6	1·3	1·1	1·2	0·7
21	2·5	9·1	3·6	21·8	2·0	5·3		1·8	1·2	0·7	1·2	0·7
22	2·7	10·7	3·6	21·8	1·9	4·6	1·5	2·1	1·2	0·7	1·2	0·7
23	3·02	11·0	3·6	21·8	1·8	3·9	1·5	2·1	1·2	0·7	1·2	0·7
24	3·5	20·2	3·6	21·8	1·8	3·9	1·6	2·7	1·2	0·7	1·2	0·7
25	3·6	21·8	3·6	21·8	1·8	3·9	1·6	2·7		0·9	1·2	0·7
26	3·6	21·8	3·5	20·2		3·9	1·6	2·7	1·3	1·1	1·2	0·7
27	3·6	21·8	3·5	20·2	1·8	3·9	1·5	2·1	1·3	1·1	1·2	0·7
28	3·7		3·4	18·6	1·8	3·9	1·5	2·1	1·2	0·7		
29	3·7		3·3	17·1	1·8	3·9	1·5	2·1	1·2	0·7		
30	3·7		3·3	17·1	1·8	3·9	1·5	2·1	1·3	1·1		
31			3·2	15·8			1·1	1·6	1·4	1·6		

MONTHLY DISCHARGE of Paul Creek, above Pinantan Lake, for 1912.

(Drainage area, 15 square miles.)

Month.	Discharge in Second-Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet.	R[illegible]
April		9·1					
May		15·8					
June	13·5	3·9	6·6	0·41	0·49	393	
July	4·6	1·6	3·0	0·20	0·23	181	
August	1·6	0·7	1·0	0·07	0·08	61	
September	1·6	0·7	1·0	0·07	0·08	60	
The period							

NOTE.—During May a large freshet occurred and Paul creek at this gauging section overflow banks and flooded the meadow through which it runs. Hence the data for May are incomplete; [illegible] servative estimate of the mean flow during this month is about 30 second-feet. A station has been [illegible] lished below Pinantan lake at a point where the stream is better confined, and, for the future, this is the one to be used.

Accuracy, "D."

Pemberton Creek (248.)

Pemberton creek has its source in the mountains west of Niskonlith lake, at an elevation of 2,200 feet, and discharges into South Thompson river from the north, near Pritchard, at an elevation of 1,110 feet. It is part of the South Thompson drainage area, as measured from a Geological Survey map, dated 1895, scale 2 miles to an inch, is 8 square miles. The precipitation would average 12 inches, seldom, if ever, reaching 18 inches; the summers are hot and dry, the winters long and severe (-20° F.). Pemberton creek is a very small stream, its maximum flow being only 10 second-feet. It is about 4 miles long, 2 to 6 feet in width, and is never much more than a foot deep. The creek flows, for the most part through a hilly, arid country, similar to that seen in the Ashcroft district. The total flow of Pemberton creek is insufficient to supply the needs of the Pemberton Estate, which holds the only records on the creek. In days gone by, water was diverted into Pemberton creek from the lakes at the head of Paul creek, for the use of the estate, but even thus augmented, the flow of Pemberton creek was small.

The fifteen hundred acres of land on the Pemberton Estate have lain idle for several years owing to the litigation in progress with regard to its disposal. The diversion of water from Niskonlith lake, and pumping on the lower benches are two methods by which this excellent land might be reclaimed. If one of these schemes were adopted, the water of Pemberton creek could be used to great advantage by local homesteaders. The station on Pemberton creek was established August 26, 1911, by C. G. Cline. The measuring section is located opposite the Warren house, 2 miles from the mouth; a standard vertical staff gauge is driven into the right bank at the section, and its datum referred to two bench-marks. In low water, measurements are made by floats; in high water, by wading. The section is satisfactory; the control is good, banks not liable to overflow, current uniform, and one channel with a permanent sandy bed.

Discharge Measurements of Pemberton Creek, two miles from mouth, 1911.

Date	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity	Gauge height.	Discharge
1911			Feet.	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
August 26	C. G. Cline					1·00	0·01*
1912							
April 16	C. G. Cline, E. M. Dann		2·0	2·0	0·8	1·07	0·2
May 20	E. M. Dann					1·[illegible]	2·1†

* Measured by noting time required to fill a receptacle of known capacity.
† Float measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Pemberton Creek, two miles from mouth, for 1911.

Day	September.		October.	
	Gauge height	Discharge.	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·0	0·05
2			1·0	0·05
3			1·0	0·05
4			1·05	0·3
5			1·05	0·3
6			1·05	0·3
7			1·05	0·3
8			1·05	0·3
9			1·05	0·3
10			1·05	0·3
11			1·05	0·3
12			1·05	0·3
13			1·05	0·3
14			1·05	0·3
15			1·05	0·3
16			1·05	0·3
17			1·05	0·3
18			1·05	0·3
19			1·1	0·6
20			1·1	0·6
21			1·1	0·6
22	1·02	0·16	1·1	0·6
23	1·02	0·16	1·1	0·6
24	1·02	0·16	1·1	0·6
25	1·02	0·16	1·1	0·6
26	1·02	0·16	1·1	0·6
27	1·02	0·16	1·1	0·6
28	1·02	0·16	1·1	0·6
29	1·0	0·05	1·1	0·6
30	1·0	0·05	1·1	0·6
31			1·1	0·6

MONTHLY DISCHARGE of Pemberton Creek, two miles from mouth, for 1911.
(Drainage area, 8 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile	Depth in inches on Drainage area	Total in acre-feet.	Inches
October	0·6	0·05	0·4	0·05	0·06	25	
The period							

NOTE.—Station was established August 26, 1911.
Accuracy, "A.

DAILY GAUGE HEIGHT AND DISCHARGE of Pemberton Creek, two miles from mouth, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·5	8·9		1·1	1·05	0·3	0·95	0·02	1·0	0·05
2			1·5	8·9	1·15	1·1	1·05	0·3	0·95	0·02	1·0	0·05
3				8·5	1·1	0·6	1·0	0·05	0·95	0·02	1·0	0·05
4				8·0	1·1	0·06	1·0	0·05	0·95	0·02	0·95	0·02
5			1·45	7·5	1·1	0·6	1·05	0·3	0·9	0·0	0·95	0·02
6			1·45	7·5	1·05	0·3	1·0	0·05	0·95	0·02	0·95	0·02
7	1·1	0·6	1·4	6·0		0·3	1·05	0·3	0·95	0·02	1·0	0·05
8	1·1	0·6	1·4	6·0		0·3	1·05	0·3	0·95	0·02	1·05	0·3
9	1·1	0·6	1·35	4·8	1·05	0·3	1·05	0·3	0·95	0·02	1·05	0·3
10	1·1	0·6	1·35	4·8	1·05	0·3	1·0	0·05	0·95	0·02	1·0	0·05
11	1·1	0·6		4·2	1·0	0·05	1·05	0·3	0·95	0·02	1·0	0·05
12	1·1	0·6	1·3	3·6	1·0	0·05	1·25	2·6	0·95	0·02	1·0	0·05
13	1·1	0·6	1·3	3·6	1·0	0·05	1·2	1·7	0·95	0·02	1·0	0·05
14	1·1	0·6	1·3	3·6		0·05	1·2	1·7	0·95	0·02	1·0	0·05
15	1·1	0·6	1·25	2·6		0·05	1·15	1·1	0·95	0·02	1·0	0·05
16	1·1	0·6	1·25	2·6	1·0	0·05	1·15	1·1	1·0	0·05	1·0	0·05
17	1·15	1·1		2·3	1·1	0·6	1·15	1·1	1·0	0·05		
18	1·2	1·7		2·0	1·05	0·3	1·1	0·6	1·0	0·05		
19		2·0	1·2	1·7	1·05	0·3	1·0	0·05	0·95	0·02		
20		2·3	1·2	1·7	1·05	0·3	1·05	0·3	0·95	0·02		
21	1·25	2·6	1·2	1·7	1·0	0·05	1·05	0·3	0·95	0·02		
22	1·25	2·6	1·2	1·7	1·0	0·05	1·05	0·3	0·95	0·02		
23	1·3	3·6	1·2	1·7	1·05	0·3	1·1	0·6	0·95	0·02		
24	1·35	4·8		1·6	1·0	0·05	1·05	0·3	0·95	0·02		
25	1·3	3·6		1·4	1·0	0·05	1·05	0·3	1·0	0·05		
26	1·3	3·6	1·15	1·1	1·0	0·05	1·05	0·3	1·0	0·05		
27	1·3	3·6	1·15	1·1	1·05	0·3	1·05	0·3	0·95	0·02		
28	1·4	6·0	1·15	1·1	1·05	0·3	1·0	0·05	1·0	0·05		
29	1·45	7·5	1·15	1·1	1·0	0·05	1·0	0·05	1·0	0·05		
30	1·5	8·9	1·15	1·1	1·05	0·3	1·0	0·05	1·0	0·05		
31				1·1			0·95	0·02	1·0	0·05		

MONTHLY DISCHARGE of Pemberton Creek, two miles from mouth, for 1912.

(Drainage area, 8 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	8·9	0·6	2·5	0·31	0·35	149	
May	8·9	1·1	3·7	0·46	0·53	227	
June	1·1	0·05	0·29	0·04	0·04	17	
July	2·6	0·02	0·49	·06	0·07	30	
August	0·05	0·0	0·03	0·004	0·005	2	
The period							12

Accuracy, "B."

PENDLETON CREEK (227).

Pendleton creek has its source in the hills south of Kamloops lake, at an elevation of 3,800 feet, and discharges into Cherry creek at Kensington ranch, at an elevation of 2,000 feet. It is part of the Cherry-Thompson drainage; the drainage area, as measured from the Dominion sectional map, dated May 15, 1907, scale 3 miles to an inch, is 4 square miles. Pendleton creek is a small irrigation stream in the heart of the Dry Belt; the summers are hot and dry, the winters long and cold (–30° F.): the mean annual precipitation is about 10 inches.

The stream is not very important, running only for a few weeks in the spring; in very dry years there is no flow. About 2 miles from the mouth, the freshet water is stored in a small meadow, 10 acres in extent, by a dam about 100 feet long, and 4 feet high.

A station was established on Pendleton creek April 23, 1912, by H. J. E. Keys. The measuring section is located about 200 yards above the dam and 175 yards below the cattle crossing. A standard vertical staff gauge is located 50 yards below the cattle crossing. The measuring section is fair, there being one permanent channel, and a uniform current; but the banks, in very high water, are liable to overflow. The datum of the gauge is referred to three bench-marks.

DISCHARGE MEASUREMENTS of Pendleton Creek, near Cornwall's ranch, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1912.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
April 23	H. J. E. Keys	1057	4	1·3	0·3	1·15	0·4
May 18	"	1057	4	3·1	1·3	1·35	3·9
May 28	"	1057	3·5	1·3	0·9	1·22	1·1
June 26	"				..	1·00	0·0

GAUGE HEIGHTS AND DAILY DISCHARGE of Pendleton Creek, near Cornwall's ranch, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height	Dis-charge	Gauge height.	Dis-charge	Gauge height	Dis-charge	Gauge height	Dis-charge	Gauge height	Dis-charge	Gauge height.	Dis-charge
	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·3	2·6	1·2	0·8	1·0	0·0	1·0	0·0		
2				3·0		0·8		0·02		0·0	0·85	0·0
3				3·1		0·8		0·05	1·0	0·0	1·0	0·0
4				3·8	1·2	0·8	1·05	0·08	1·0	0·0		0·04
5				1·2		0·7	1·25	1·7		0·0		0·08
6				1·6		0·6		1·7		0·0		0·12
7				5·0	1·15	0·18		1·7	1·0	0·0	1·1	0·15
8				5·4		0·37	1·25	1·7		0·0		0·11
9				5·9		0·26		1·7	1·0	0·0	1·05	0·08
10				6·1	1·1	0·15	1·25	1·7		0·0		0·04
11			1·15	6·9		0·15		1·3	1·0	0·0	1·0	0·0
12				7·7	1·1	0·15		0·9		0·0		0·0
13			1·5	8·5		0·26	1·15	0·47		0·0	1·0	0·0
14				6·9		0·26		0·27	0·2	0·0		
15			1·4	5·3	1·15	0·48	1·05	0·08		0·0		
16				5·0		0·28		0·01	0·25	0·0		
17				4·7	1·05	0·08	1·0	0·0		0·0		
18				4·4		0·08		0·0		0·0		
19			1·35	4·0	1·05	0·08	1·0	0·0	0·3	0·0		
20			1·[illegible]5	4·0		0·05		0·05		0·0		
21				3·[illegible]		0·02		0·10		0·0		
22			1·3	2·6	1·0	0·0	1·1	0·15	0·3	0·0		
23				1·7		0·0		0·15		0·0		
24			1·2	0·8		0·0		0·15	0·25	0·0		
25				0·8		0·0	1·1	0·15		0·0		
26			1·2	0·8	1·0	0·0		0·11	0·25	0·0		
27				0·8		0·0	1·05	0·07		0·0		
28	1·2	0·8	1·2	0·8	1·0	0·0		0·07	0·25	0·0		
29		1·2		0·8		0·0	1·05	0·07		0·0		
30		1·6		0·8	1·0	0·0		0·05		0·0		
31		2·1	1·2	0·8		0·0		0·03	0·25	0·0		

MONTHLY DISCHARGE of Pendleton Creek, near Cornwall's ranch, for 1912.

(Drainage area, 4 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	8·5	0·8	3·7	0·9	1·04	227	
June	0·5	0·0	0·26	0·06	0·07	15	
July	0·0	1·7	0·5	0·12	0·14	29	
The period							12

Accuracy, "B."

Peterson Creek (274).

Peterson creek has its source in Jacko lake, 10 miles south of Kamloops, at an elevation of 2,200 feet and discharges into the South Thompson at Kamloops, at an elevation of 1,140 feet. It is part of the Thompson drainage; the drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 55 square miles. This is a very contentious irrigation stream, situated in the most arid section of the Dry Belt. The summers are very hot and dry, the winters long and cold (−30 F.) The annual precipitation is approximately 10 to 12 inches.

Peterson creek is a good example of an over-recorded irrigation stream. There are records for over 1,500 inches extant. During 1912 (a very wet season), Jacko lake was so low that the water did not reach the level of the ditch intakes. Four miles below Jacko lake, Peterson creek did not attain a discharge greater than 1 second-foot and only ran for 10 days. Above the city of Kamloops there are several small springs in the creek, which are used for irrigation purposes. In the city itself the stream only runs spasmodically during the spring. There is no regular station on Peterson creek, but four miscellaneous measurements were taken during 1912. In the spring of that year the freshet was very large, running 80 second-feet, and did considerable damage to property in the city.

The city of Kamloops has under consideration the construction of a concrete conduit for carrying the flood waters of Peterson creek through the city. (*See* miscellaneous measurements on Peterson creek and on Jacko creek, which is the upper part of Peterson creek.)

Pollard Creek (116).

Pollard creek has its source in the hills northeast of Coquitlam, at an elevation of 2,000 feet, and discharges into Pitt river near Coquitlam, at an elevation of 10 feet. It is part of the Pitt-Fraser drainage; the estimated drainage area above the station is 3 square miles. The annual precipitation, including from 1 to 2 feet of snow, is 60 inches; the winter conditions are mild, the stream being open the entire year. The creek is of little value, except as a possible water supply for the town of Coquitlam.

The station was established November 20, 1911, by K. H. Smith. It is located about 300 yards east of the Pollard house, 5 miles out of Coquitlam. A staff gauge is situated on the left bank, and its datum is referred to three bench-marks. The measuring section is at the gauge, and is well located; there is only one permanent channel, good banks (liable to overflow slightly in high water), good control and a uniform current. All measurements are made by wading.

Discharge Measurements of Pollard Creek, at mouth, 1911.

Date	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft per sec.	Feet.	Sec.-ft.
Nov. 20	K. H. Smith	1057	5·0	4·6	1·[illegible]	1·7	[illegible]
Dec. 23	"	1057	4·5	2·8	1·6	1·5	[illegible]

Daily Gauge Height and Discharge of Pollard Creek, near mouth, for 1911.

Day.	November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1·3	2·7
2			1·3	2·7
3			1·2	2·0
4			1·2	2·0
5			1·3	2·7
6			1·4	3·6
7			1·1	3·6
8			1·[illegible]	9·4
9			1·6	6·1
10			1·5	4·7
11			1·6	6·1
12			1·4	3·6
13			1·3	2·7
14			1·2	2·0
15			1·4	3·6
16			1·3	2·7
17			1·2	2·0
18			1·3	2·7
19			1·1	3·6
20	1·7	7·7	1·3	2·7
21	1·5	4·7	1·3	2·7
22	1·4	3·6	1·[illegible]	6·1
23	1·3	2·7	1·5	4·7
24	1·2	2·0	1·1	3·6
25	1·6	6·1	1·3	2·7
26	1·1	3·6	1·2	2·0
27	1·3	2·7	1·4	3·6
28	1·3	2·7	1·3	2·7
29	1·2	2·0	1·2	2·0
30	1·3	2·7	1·1	1·5
31			1·1	1·5

Monthly Discharge of Pollard Creek, near mouth, for 1911.

(Drainage area, 3 square miles.)

Month	Discharge in Second-Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
November	7·7	2·0					
December	9·4	1·5	3·4	1·1	1·3	209	
The period							60

Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	January.		February.		March.		April.		May.		June.	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft
1.	1.1	1.5	1.3	2.7	0.9	0.7	0.5	0.1	1.0	1.0	0.7	0
2.	1.0	1.0	1.2	2.0	0.9	0.7	0.6	0.2	1.1	1.5	0.7	0
3.	1.0	1.0	1.1	1.5	0.9	0.7	0.7	0.3	1.1	1.5	0.6	[illegible]
4.	0.9	0.7	1.1	1.5	0.8	0.4	0.8	0.4	1.0	1.0	0.6	[illegible]
5.	0.9	0.7	1.0	1.0	0.8	0.1	0.7	0.3	1.0	1.0	0.6	[illegible]
6.	1.0	1.0	1.0	1.0	0.8	0.4	0.6	0.2	1.0	1.0	0.6	[illegible]
7.	0.9	0.7	1.0	1.0	0.8	0.1	0.6	0.2	0.9	0.7	0.6	[illegible]
8.	0.8	0.4	1.1	1.5	0.7	0.3	[illegible]	0.2	0.9	0.7	0.5	[illegible]
9.	0.9	0.7	1.1	3.6	0.7	0.3	0.8	0.1	0.8	0.4	0.5	0.1
10.	1.1	1.5	1.4	3.6	0.7	0.3	1.1	1.5	0.8	0.1	0.5	[illegible]
11.	1.4	3.6	1.1	3.6	0.7	0.3	1.0	1.0	0.7	0.3	0.7	[illegible]
12.	1.7	7.7	1.1	3.6	0.7	0.3	0.9	0.7	0.6	0.2	1.0	1.0
13.	1.8	9.4	1.4	3.6	0.7	0.3	0.9	0.7	0.6	0.2	1.0	1.0
14.	1.8	9.1	1.5	1.7	0.8	0.4	0.9	0.7	0.6	0.2	1.0	1.0
15.	1.6	6.1	1.7	7.7	0.8	0.4	0.9	0.7	0.6	0.2	1.0	1.0
16.	1.5	4.7	1.6	6.1	0.8	0.1	0.8	0.1	0.6	0.2	0.9	0.7
17.	1.3	2.7	1.5	1.7	0.8	0.4	0.9	0.7	0.6	0.2	0.8	0.4
18.	1.3	2.7	1.4	3.6	0.7	0.3	1.0	1.0	0.6	0.2	0.8	0.4
19.	1.2	2.0	1.3	2.7	0.7	0.3	0.9	0.7	0.7	0.3	0.7	[illegible]
20.	1.1	3.6	1.2	2.0	0.7	0.3	0.9	0.7	0.9	0.7	0.8	0.4
21.	1.3	2.7	1.1	1.5	0.7	0.3	0.9	0.7	1.2	2.0	1.1	1.5
22.	1.2	2.0	1.3	2.7	0.7	0.3	0.9	0.7	1.2	2.0	1.1	1.5
23.	1.2	2.0	1.2	2.0	0.7	0.3	1.0	1.0	1.3	2.7	1.0	1.0
24.	1.1	3.6	1.1	1.5	0.6	0.2	0.9	0.7	1.1	1.5	1.0	1.0
25.	1.3	2.7	1.1	1.5	0.6	0.2	0.8	0.1	1.1	1.5	0.9	0.7
26.	1.4	3.6	1.1	1.5	0.6	0.2	0.8	0.1	1.0	1.0	0.8	0.4
27.	1.3	2.7	1.0	1.0	0.6	0.2	0.9	0.7	0.9	0.7	0.7	[illegible]
28.	1.5	4.7	1.0	1.0	0.6	0.2	1.0	1.0	0.8	0.1	0.7	[illegible]
29.	1.7	7.7	1.0	1.0	0.6	0.2	1.2	2.0	0.8	0.4	0.7	0
30.	1.5	4.7			0.6	0.2	1.2	2.0	0.8	0.4	0.7	0
31.	1.4	3.6			0.6	0.2			0.8	0.4		

of Pollard Creek, near mouth, for 1912.

July		August		September		October		November		December		
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Day.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
0·7	0·3	0·6	0·2	1·5	1·7	0·6	0·2	1·1	1·5	1·4	3·6	1
0·7	0·3	0·6	0·2	1·7	7·7	0·7	0·3	1·1	1·5	1·5	4·7	2
0·7	0·3	0·6	0·2	1·6	6·1	0·8	0·1	1·2	2·0	2·1	14·6	3
0·8	0·4	0·5	0·1	1·4	3·6	0·7	0·3	4·1	3·6	2·0	12·9	4
0·9	0·7	0·5	0·1	1·2	2·0	0·7	0·3	1·5	4·7	1·8	9·4	5
0·9	0·7	0·5	0·1	1·2	2·0	0·7	0·3	1·5	4·7	1·7	7·7	6
0·9	0·7	0·5	0·1	1·2	2·0	0·6	0·2	1·5	1·7	1·6	6·1	7
0·8	0·4	0·7	0·3	1·0	1·0	0·7	0·3	1·4	3·6	1·6	6·1	8
0·7	0·3	0·6	0·2	0·9	0·1	0·7	0·3	1·3	2·7	1·8	9·4	9
0·7	0·3	0·7	0·3	0·8	0·4	0·7	0·3	1·5	4·7	1·7	7·7	10
0·7	0·3	0·6	9·2	0·8	0·4	0·7	0·3	1·6	6·1	1·6	6·1	11
0·7	0·3	0·6	0·2	0·8	0·4	0·7	0·3	1·7	7·7	1·5	4·7	12
0·7	0·3	0·6	0·2	0·7	0·3	0·7	0·3	1·7	7·7	1·1	3·6	13
0·6	0·2	0·6	0·2	0·7	0·3	0·7	0·3	1·5	4·7	1·3	2·7	14
0·6	0·2	1·4	3·6	0·7	0·3	1·1	1·5	1·3	2·7	1·3	2·7	15
0·6	0·2	1·7	7·7	0·6	0·2	1·3	2·7	1·2	2·0	1·6	6·1	16
0·6	0·2	1·3	2·7	0·6	0·2	1·4	3·6	1·2	2·0	1·5	4·7	17
0·5	0·1	1·2	2·0	0·6	0·2	1·3	2·7	1·3	2·7	1·3	2·7	18
0·5	0·1	1·1	1·5	0·6	0·2	1·3	2·7	1·4	3·6	1·3	2·7	19
0·5	0·1	1·0	1·0	0·6	0·2	1·3	2·7	1·5	4·7	1·3	2·7	20
0·5	0·1	0·9	0·7	0·6	0·2	1·3	2·7	2·3	20·0	1·3	2·7	21
0·5	0·1	0·8	0·4	0·5	0·1	1·3	2·7	1·8	9·4	1·3	2·7	22
0·6	0·2	0·7	0·3	0·5	0·1	1·3	2·7	1·6	6·1	1·3	2·7	23
0·7	0·3	0·7	6·3	0·5	0·1	1·2	2·0	1·5	1·7	1·3	2·7	24
0·7	0·3	0·7	0·3	0·5	0·1	1·2	2·0	1·4	3·6	1·4	3·6	25
0·7	0·3	0·7	0·3	0·5	1·1	1·2	2·0	1·3	2·7	1·1	3·6	26
0·6	0·2	0·7	0·3	0·5	0·1	1·1	1·5	1·2	2·0	1·5	4·7	27
0·6	0·2	0·9	0·7	6·5	0·1	1·1	1·5	1·2	2·0	1·5	4·7	28
0·6	0·2	1·1	1·5	0·5	0·1	1·2	2·0	1·3	2·7	1·6	6·1	29
0·5	0·1	1·3	2·7	0·6	0·2	1·1	1·5	1·3	2·7	1·5	4·7	30
0·5	0·1	1·3	2·7			1·1	1·5	...	...	1·5	4·7	31

MONTHLY DISCHARGE of Pollard Creek, near mouth, for 1912.

(Drainage area, 3 square miles.)

Month	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean	Per sq. mile	Depth in inches on Drainage area.	Total in acre-feet	Inches
January	9·4	0·4	3·3	1·1	1·3	203	
February	7·7	1·0	2·6	0·9	1·0	150	
March	0·7	0·2	0·3	0·1	0·1	18	
April	2·0	0·1	0·7	0·23	0·26	42	
May	2·7	0·2	0·8	0·27	0·31	49	
June	1·5	0·1	0·5	0·17	0·19	30	
July	0·7	0·1	0·3	0·1	0·11	18	
August	7·7	0·1	1·0	0·33	0·38	61	
September	7·7	0·1	1·1	0·37	0·41	65	
October	3·8	0·2	1·4	0·47	0·54	86	
November	20·0	1·5	4·4	1·5	1·7	262	
December	14·6	2·7	5·3	1·8	2·1	326	
The year	20·0	0·1	1·8	0·6	8·4	1,310	[illegible]

Accuracy "B."

QUENVILLE CREEK (270).

Quenville creek has its source in the hills east of the Guichon valley, at an elev tion of 1,000 feet, and discharges into Guichon creek, a mile above Mamit lake, at an elevation of 3,300 feet. It is part of the Guichon-Nicola-Thompson drainage; the drainage area, as measured from the Geological Survey map, dated 1895, scale 2 mile to an inch, is 7 square miles. This is an irrigation stream situated in the Dry Belt the summers are hot and dry, the winters long and cold (−40 F.), the mean annu precipitation is between 12 and 15 inches.

Quenville creek is not of much importance: There is a small lake which is u as a storage reservoir for the spring freshet. As a rule the stream runs dry in Jun and July. *See* miscellaneous measurements on Quenville creek. (Outside the Ra way Belt.)

RAINBOW CREEK (111).

Rainbow creek has its source in the mountains on the east side of Pitt lake, o side the Railway Belt, at an elevation of 2,000 feet, and discharges into Pitt lake an elevation of 10 feet. It is part of the Pitt-Fraser drainage. The drainage ar is estimated at 20 square miles, and the annual precipitation about 70 inches. T watershed of Rainbow creek is comparatively high, rocky and wooded, with s most of the year in the higher altitudes.

It would be possible to develop power on Rainbow creek, there being a 630 f fall in half a mile near the mouth. There is said to be a lake near the head-wat which might be utilized as a storage reservoir. There is a small flat at the mouth

The station on Rainbow creek was established on November 11, 1911, by C Cline. It is about 2 miles above Fader's brickyard on the east side of Pitt lake. T gauge is a vertical staff, 7 feet long, and is fastened to a stump, 100 feet below high fall, and 300 yards from the mouth of the creek. The datum of the gauge is referred to three bench-marks. Measurements are made by wading, except at high water, when boat measurements are made.

DISCHARGE MEASUREMENTS of Rainbow Creek, at mouth, 1911-12.

Date	Hydrographer	Meter No.	Width	Area of section	Mean velocity	Gauge height	Discharge
1911			Feet	Sq. ft.	Ft. per sec.	Feet	Sec.-ft.
Nov. 11	Cline & Smith	1053	38	61	0.7	0.82	46
Dec. 28	K. H. Smith	1057	36	43	1.2	0.85	51
1912							
Aug. 7	C. G. Cline	1016	33	46	0.7	0.64	32
Nov. 2	"	1016	36	75	1.0	1.05	75

GAUGE HEIGHT AND DISCHARGE of Rainbow Creek, at mouth, for 1912.

Day	August		November		December	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.
1		33		75	0.95	61
2		33	1.05	75		62
3		33		82		63
4		33		88		64
5		33		94		65
6		33		100		66
7	0.64	33		106		67
8		31		112	1.0	68
9	0.6	30		117		75
10		90	1.4	122		82
11		150		116		89
12		210		109		96
13	2.5	270		102		103
14		200	1.2	95		110
15		130		82	1.35	116
16	0.9	55		68		113
17		55	0.9	55		110
18		55		50		107
19	0.9	55		45		104
20		52		40		101
21		49	0.7	37		98
22	0.8	45		36	1.2	95
23		50		35		100
24	0.9	55	0.65	31		105
25		55		38		110
26		55		42		115
27		55		46		120
28		55		50		125
29		55		54	1.45	129
30		55		58		129
31		55				129

MONTHLY DISCHARGE of Rainbow Creek, at mouth, for 1912.
(Drainage area, 20 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall
	Maximum	Minimum	Mean	Per sq. mi.	Depth in inches on drainage area.	Total in acre-feet.	Inches
August	270	30	71	3·5	4·0	4,370	
November	122	34	72	3·6	4·0	4,280	
December	129	61	97	4·8	5·5	5,960	
The period							70

ROBBINS CREEK (261).

Robbins creek has its source in the hills in township 19-15-6, at an elevation of 3,500 feet and, flowing in a northerly direction, discharges into Monte creek a mile and a quarter from the mouth, at an elevation of 1,500 feet. It is part of the Monte South Thompson drainage; the drainage area, as measured from a Geological Survey map, dated 1895, scale 2 miles to an inch, is 15 square miles. The mean annual precipitation is about 10 inches; the winters are severe (-40° F.) with a small snowfall, the summers are very hot and dry.

Robbins creek is about 6 miles long, flowing into Monte creek from the west, about one and a quarter mile above the mouth. It is about 4 feet wide and 1 foot deep, with a mean velocity of from 0·2 to 4 feet per second. The creek flows through an agricultural district in the Dry Belt, and is a very contentious irrigation stream. It is recorded several times over, and, especially in dry seasons, considerable trouble arises, due to the scarcity of water. The maximum flow occurred on May 9, 1912, and was 9 c.f.s. The stream was practically dry in August; the mean flow during the irrigation season was about 1·5 c.f.s., which does not include the water that is diverted above the ganging station, and conducted into the Bace Lake storage reservoir.

The station on Robbins creek was established May 26, 1911, by C. E. Richardson. The measuring section is located below Albert Duck's diversion. A vertical staff gauge is located on the right bank below the meadows and opposite Albert Duck's house; the datum of the gauge is referred to three bench-marks. All measurements are made by wading.

DISCHARGE MEASUREMENTS of Robbins Creek, near Albert Duck's, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 26	C. E. Richardson	1048	7·5	2·8	1·1	4·43	[illegible]
May 26	W. M. Carlyle	1044	8·0	4·6	0·7	4·43	[illegible]
June 4	C. E. Richardson	1048	7·0	3·6	0·5	4·38	[illegible]
June 15	W. M. Carlyle	1044	8·0	5·4	4·0	4·52	[illegible]
July 10	"	1044	6·5	3·0	0·3	4·36	[illegible]
" 13	"	1044	4·0	0·8	0·5	4·27	[illegible]
" 21	"	1044	4·7	0·4	0·3	4·18	[illegible]
May	C. E. Richardson	1048	10·0	7·4	4·0	4·65	[illegible]
July	"	1048	2·0	0·6	0·7	4·30	[illegible]

Daily Gauge Height and Discharge of Robbins Creek, near Albert Duck's, for 1911.

Day	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Discharge.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.35	1.1	1.30	0.6	1.10	0.1
2			1.38	1.6	1.30	0.6	1.08	0.0
3			1.38	1.6	1.29	0.6	1.08	0.0
4			1.38	1.6	1.28	0.5	1.09	0.1
5			1.38	1.6	1.28	0.5	1.08	0.0
6			1.40	2.0	1.26	0.4	1.11	0.1
7			1.36	1.2	1.28	0.5	1.18	0.1
8			1.35	1.1	1.30	0.6	1.11	0.1
9			1.38	1.5	1.30	0.6	1.10	0.1
10			1.40	2.0	1.31	0.7	1.10	0.1
11			1.42	2.6	1.30	0.6	1.10	0.1
12			1.42	2.6	1.29	0.6	1.09	0.1
13			1.41	2.3	1.28	0.5	1.08	0.0
14			1.45	3.3	1.26	0.4	1.08	0.0
15			1.52	5.2	1.25	0.4	1.06	0.0
16			1.50	4.7	1.25	0.4	1.02	0.0
17			1.42	1.1	1.22	0.2	Creek dry.	
18			1.46	3.6	1.22	0.2		
19			1.42	2.6	1.20	0.2		
20			1.41	2.3	1.20	0.2		
21			1.40	2.0	1.20	0.2		
22			1.42	2.3	1.19	0.2		
23			1.40	2.0	1.16	0.1		
24			1.38	1.6	1.15	0.1		
25			1.36	1.2	1.12	0.1		
26	1.41	2.3	1.32	0.8	1.11	0.1		
27	1.40	2.0	1.32	0.8	1.11	0.1		
28	1.41	2.3	1.32	0.8	1.10	0.1		
29	1.41	2.3	1.30	0.6	1.10	0.1		
30	1.40	2.0	1.30	0.6	1.10	0.1		
31	1.39	1.8			1.10	0.1		

Monthly Discharge of Robbins Creek, near Albert Duck's, for 1911.
(Drainage area, 15 square miles.)

Month.	Discharge in Second Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Run-off. Total in acre-feet.	Rainfall. Inches.
June	5.2	0.6	2.1	.14	.16	125	
July	0.7	0.1	.34	.02	.02	21	
August	0.1	0.0	.03	.002	.002	2	
The period							9

Note.—This station was established after the spring freshet had occurred, so there is no record of the flow of this creek during April and May of 1911. The total run-off for these two months, however, would not have been more than 500 acre-feet. Robbins creek went dry about the middle of August, 1911. These measurements do not include the water that is diverted above the ganging station, and conducted to the storage reservoir at Buck lake.

Accuracy, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of Robbins Creek, near Albert Duck's, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	3	0·4	1·48	2·8	1·47	2·6	1·37	1·1	1·25	0·1	1·27	0·2
2	1·4	1·4	1·55	4·4	1·42	1·7	1·38	1·2	1·25	0·1	1·30	0·4
3	1·38	1·2	1·58	5·1	1·45	2·2	1·38	1·2	1·25	0·1	1·28	0·3
4	1·42	1·7	1·55	4·4	1·42	1·7	1·38	1·2	1·25	0·1	1·27	0·2
5	1·43	1·8	1·55	4·4	1·40	1·4	1·38	1·2	1·25	0·1	1·27	0·2
6	1·37	1·1	1·60	5·6	1·40	1·4	1·36	1·0	1·25	0·1	1·27	0·2
7	1·40	1·4	1·66	7·1	1·40	1·4	1·37	1·1	1·25	0·1	1·28	0·3
8	1·41	1·6	1·62	6·1	1·37	1·1	1·34	0·8	1·25	0·1	1·27	0·2
9	1·42	1·7	1·71	8·4	1·35	0·9	1·31	0·5	1·25	0·1	1·27	0·2
10	1·41	1·6	1·63	6·4	1·32	0·6	1·30	0·4	1·25	0·1	1·27	0·2
11	1·49	3·0	1·63	6·4	1·36	1·0	1·30	0·4	1·30	0·4	1·25	0·1
12	1·43	1·8	1·60	5·6	1·37	1·1	1·30	0·4	1·30	0·4	1·25	0·1
13	1·42	1·7	1·56	4·6	1·35	0·9	1·31	0·5	1·35	0·9	1·22	0·1
14	1·4	1·4	1·6	5·6	1·36	1·0	1·30	0·4	1·32	0·6	1·21	0·0
15	1·4	1·4	1·6	5·6	1·38	1·2	1·30	0·4	1·32	0·6	1·20	0·0
16	1·42	1·7	1·64	5·8	1·45	2·2	1·3	0·4	1·32	0·6	Creek	dry.
17	1·52	3·6	1·67	7·4	1·42	1·7	1·3	0·4	1·30	0·4		
18	1·47	2·6	1·7	8·1	1·40	1·4	1·3	0·4	1·30	0·4		
19	1·45	2·2	1·7	8·1	1·36	1·0	1·3	0·4	1·30	0·4		
20	1·50	3·2	1·7	8·1	1·36	1·0	1·28	0·3	1·30	0·4		
21	1·47	2·6	1·7	8·1	1·35	0·9	1·26	0·2	1·30	0·4		
22	1·55	4·4	1·7	8·1	1·32	0·6	1·31	0·5	1·27	0·2		
23	1·52	3·6	1·7	8·1	1·31	0·5	1·29	0·3	1·27	0·2		
24	1·57	4·8	1·7	8·1	1·33	0·7	1·30	0·4	1·27	0·2		
25	1·50	3·2	1·7	8·1	1·36	1·0	1·35	0·9	1·27	0·2		
26	1·50	3·2	1·7	8·1	1·35	0·9	1·3	0·4	1·27	0·2		
27	1·50	3·2	1·67	7·1	1·35	0·9	1·28	0·3	1·27	0·2		
28	1·48	2·8	1·62	6·1	1·33	0·7	1·27	0·2	1·27	0·2		
29	1·50	3·2	1·68	7·6	1·31	0·5	1·27	0·2	1·25	0·1		
30	1·48	2·8	1·53	3·8	1·32	0·6	1·25	0·1	1·25	0·1		
31			1·50	3·2			1·25	0·1	1·27	0·2		

MONTHLY DISCHARGE of Robbin's Creek, near Albert Duck's, for 1912.

(Drainage area, 15 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	1·8	0·1	2·3	·15	·17	137	
May	8·1	2·8	6·3	·42	·48	387	
June	2·6	0·5	1·2	·08	·09	71	
July	1·2	0·1	0·6	·04	·05	37	
August	0·9	0·1	0·3	·02	·02	18	
September	0·4	0	0·1	·01	·01	6	
The period							12

NOTE.—In 1912, Robbin's creek ran dry about the middle of September. The measurements do not include the water that is diverted above the gauging station and conducted to the storage reservoir at Burn lake.

Accuracy, B.

RUSHTON CREEK (1151).

Rushton creek rises in Rushton lake at an elevation of 700 feet, and discharges into Pitt lake on the east side in township 5-1-7, opposite Goose island, at an elevation of 10 feet. It is part of the Pitt-Fraser drainage. The watershed is in the Coast district, with a mean annual precipitation of about 60 inches. The stream does not freeze over at the mouth, but in the higher altitudes the winter conditions are more severe.

Mr. E. J. Fader, of New Westminster, proposes to develop power on Rushton creek. Rushton lake is 700 feet above Pitt lake, and only three-quarter mile distant. Below the lake there is a fall about 100 feet high, only one-quarter mile from Pitt lake. The water is to be diverted above the fall and conveyed in a flume and pipe line to the power-house near Pitt lake. Rushton lake could be used for storage. The power is to be used to run a quarry and gravel screening plant.

A station was established on Rushton creek on November 3, 1912, and gauge readings are being taken three times a week. There is a vertical staff gauge just at the lower end of the canyon, below the fall, and one-quarter mile from Pitt lake. The meter measurements are made by wading at a section 100 feet below the gauge. During the season of 1913 sufficient meter measurements will be taken to locate the rating curve.

One current meter measurement was made on November 3, 1912, and the discharge was 63·6 cubic feet per second. This was above the low-water flow and might be a little below the average flow that could be obtained.

SALMON RIVER (302-304).

Salmon river rises in the hills, about 20 miles south of Grand Prairie, at an elevation of 4,500 feet, its source being separated from the Okanagan watershed by a low divide. Thence it flows in a westerly direction, for about 18 miles, to the outlet of Fish lake. From that point it makes a sharp turn and flows northerly for 17 miles, F rand Prairie it flows easterly for 20 miles, turns sharply and flows north f. 2 es, emptying into Shuswap lake at Salmon Arm, at an elevation of 1,150 fe Salmon river varies from 30 feet to 50 feet in width, from 1 foot to 6 feet in dept and has a mean velocity of from 1 foot to 3 feet per second.

From its source to about the east boundary of township 17-12-6, just east of t mouth of Bolean creek, Salmon river is wholly within the Dry Belt, and the me annual precipitation is about 12 inches. Below Bolean creek the precipitation (inches) during the growing season is nearly normal and irrigation is not required.

Grand Prairie is an excellent irrigation farming district lying in a bowl-shap expansion of Salmon river valley, at an elevation of about 1,800 feet. It is about 1 miles due south of the C.P.R. at Ducks. The projected branch of the Canad Northern Pacific from Kamloops to the Okanagan will pass through Grand Prairie.

Grand Prairie is about 4 or 5 miles long (east and west) and about 2 miles wi comprising over 6,000 acres of good irrigable land, in the main open and almost l country. About one-half is at present under cultivation. It is suitable for any ki of mixed farming, vegetables, grain, hay, stock raising and for fruit.

For irrigation, Grand Prairie obtains most of its water supply from Salmon rive augmented by Ingram creek and Essell creek. The run-off of Salmon river w be ample for the irrigation needs if the surplus waters of the May and June fl could be stored. This, however, is probably not feasible.

Above Grand Prairie there is very little farming land, the country being a roll and broken plateau, covered with bull pine and some fir; irrigation is not neces below Bolean creek and Warren creek. At the lower easterly end of Grand Prai Salmon river flows through swampy meadows, in which the waters of the river partly retarded and stored, consequently Salmon river below these meadows is m uniform in its flow than at Wood's ranch. Salmon river near its mouth is a s stream, running through a flat and marshy country.

Salmon River at Woods' Ranch (392).—The station on Salmon river at Wo ranch was established on May 21, 1911, by C. E. Richardson. The measuring sect is located on the downstream side of the bridge at Woods' ranch, 4 miles wes Grand Prairie, on the road to Fish lake. The gauge is a standard vertical staff, feet long. It is fastened to a cribbing on the left bank of the river (looking do stream) 25 feet above the bridge. Measurements are made with a Price electric c rent meter (small) and from 6½ to 15 pounds of lead, suspended by a cable. T initial point for sounding is on the lower side of this bridge, at the left abutm The river flows north at the station, and above it the channel is straight for 25 The river is confined between the bridge abutments for all stages, and the depth v from 6 inches to 6 feet. The bed of the stream is rocky, but the chance of shifti slight. Three bench-marks were established and referred to the gauge datum. I claimed that the water sinks shortly above Woods' ranch. In 1911, W. M. Ca measured above the supposed location of sinking and at Woods' ranch. The re showed a difference of 2 c.f.s., the discharge above Woods' ranch being 4 c.f.s., an the station 2 c.f.s.

DISCHARGE MEASUREMENTS of Salmon River, at Woods' Ranch near Grand Prairie, 1911-12.

Date.	Hydrographer	Meter No.	Width	Area of section.	Mean velocity.	Gauge height	Discharge
1911			Feet.	Sq. ft.	Ft. per sec.	Feet	Sec. ft.
May 21	C. G. Cline	1046	42·0	72·7	4·2	4·00	304
May 21	C. E. Richardson	1048	38·5	75·8	4·0	4·00	306
June 5	"	1048	38·0	58·0	3·6	3·52	210
July 12	W. M. Carlyle	1044	34·0	28·7	2·2	2·71	65
July 26	"	1044	16·0	10·4	1·2	1·97	12·2
Aug. 21	"	1044	9·0	3·3	0·6	1·66	2·1
1912.							
May 10.	C. E. Richardson	1048	39	132	4·4	5·20	580
July 17.	"	1048	20	31·7	1·6	2·55	56

DAILY GAUGE HEIGHT AND DISCHARGE of Salm

Day.	March. Gauge height	March. Discharge.	April. Gauge height.	April. Discharge.	May. Gauge height	May. Discharge	June. Gauge height.	June. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.
1				17		170	3·75	[illegible]
2				17		200	3·80	[illegible]
3				17		219	3·80	[illegible]
4				17		240	3·65	[illegible]
5				17		280	3·52	[illegible]
6				18		318	3·42	174
7				18		296	3·35	160
8				18		271	3·30	150
9				18		252	3·22	[illegible]
10				18		228	3·20	[illegible]
11				20		209	3·25	141
12				22		200	3·28	[illegible]
13				24		192	3·22	[illegible]
14				24		210	3·20	[illegible]
15				25		228	3·20	[illegible]
16				26		330	3·10	[illegible]
17				26		433	3·05	[illegible]
18				27		400	2·98	[illegible]
19				28		350	2·92	[illegible]
20				42		325	2·88	[illegible]
21				56	4·0	322	2·78	[illegible]
22				70	4·0	322	2·82	[illegible]
23		11		86	3·9	294	2·85	[illegible]
24		34		103	3·8	266	2·78	[illegible]
25		30·		104	3·68	234	2·70	[illegible]
26		26·		106	3·62	220	2·65	[illegible]
27		21·		108	3·55	204	2·72	[illegible]
28		16·		110	3·5	192	2·68	[illegible]
29		16·		130	3·45	180	2·60	[illegible]
30		16		150	3·5	192	2·55	[illegible]
31		16·			3·62	220		

River, at Woods' Ranch near Grand Prairie, for 1911.

July.		August.		September.		
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Day
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
2·52	48	1·80	6·8	1·15	0·0	1
2·60	54	1·80	6·8	0·85	0·0	2
2·52	48	1·78	6·1	0·75	0·0	3
2·48	44	1·75	5·1	0·60	0·0	4
2·40	38	1·75	5·1	1·10	0·0	5
2·38	37	1·78	6·1	1·62	2·4	6
2·48	44	1·92	11·4	1·60	2·2	7
2·52	48	2·02	16	1·60	2·2	8
2·80	74	2·00	15	1·52	0·4	9
2·82	77	1·92	11	1·48	0·0	10
2·82	77	1·85	8·6	1·20	0·0	11
2·80	74	1·80	6·8	0·88	0·0	12
2·62	56	1·78	6·4	0·60	0·0	13
2·52	48	1·75	5·1	0·55	0·0	14
2·48	44	1·72	4·4	1·62	2·4	15
2·40	38	1·70	3·5	1·65	2·8	16
2·40	38	1·68	3·2	1·65	2·8	17
2·30	31	1·62	2·4	1·70	3·5	18
2·22	26	1·62	2·4	1·65	2·8	19
2·25	28	1·65	2·8	1·60	2·2	20
2·18	24	1·70	3·5	1·60	2·2	21
2·10	19	1·70	3·5	1·55	0·7	22
2·10	20	1·65	2·8	1·55	0·7	23
2·08	19	1·62	2·4	1·55	0·7	24
2·02	16	1·60	2·2	1·55	0·7	25
1·98	14	1·58	1·0	1·55	0·7	26
1·92	11	1·45	0·0	1·48	0·0	27
1·88	9·7	1·20	0·0	1·28	0·0	28
1·88	9·7	1·08	0·0	1·00	0·0	29
1·85	8·6	1·40	0·0	0·88	0·0	30
1·82	7·5	1·40	0·0			31

MONTHLY DISCHARGE of Salmon River, at Woods' Ranch, near Grand Prairie, for 1911

(Drainage area, 180 square miles.)

Month	Discharge in Second Feet				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile	Depth in inches on Drainage area	Total in acre-feet	Inch.
March	31	10	10	0·05	0·36	615	
April	150	17	48·7	0·27	0·30	2,900	
May	433	170	258	1·43	1·65	15,861	
June	266	50	126·7	0·7	0·78	7,540	
July	77	7·5	36·1	0·2	0·23	2,238	
August	16	0	4·8	0·03	0·03	295	
September	3·5	0	1·	0·0	0·0	60	
The period	433	0	40	0·22	3·0	29,500	1

NOTE.—The station on Salmon river at Woods' ranch was established on May 21, and continued until the end of September. From March 23 till May 20, measurements were taken by Messrs. Corrigan & Mitchell, civil engineers, in the interests of a private irrigation company at Grand Prairie. Their data have been used to complete the irrigation season. Mean for seven months 69 c.f.s. Winter conditions existed from November to March.

Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Salmon River, at Woods' Ranch, near Grande Prairie, for 1912.

Day.	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1·9	9·0	3·65	235	3·77	260	2·6	58	2·15	21	1·8	5·[illegible]
2	1·95	11·0	3·67	210	3·67	210	2·62	61	2·12	20	1·82	6·4
3	1·92	10·0	3·8	261	3·6	221	2·67	67	2·1	18	1·95	9·0
4	1·95	11·0	3·9	285	3·5	205	2·70	70	2·1	18	1·95	11
5	1·95	11·0	4·05	316	3·42	190	2·6	5[illegible]	2·1	18	1·95	11
6	1·95	15·0	4·17	311	3·4	186	2·6	[illegible]	2·1	18	1·95	11
7	2·05	15·5	4·37	390	3·35	177	1·65	61	2·05	15	2·0	1[illegible]
8	2·05	15·5	4·8	400	3·35	177	2·6	58	2·02	11	2·05	15
9	2·22	26·	5·37	625	3·12	190	2·6	58	1·97	12	2·0	1[illegible]
10	2·32	33·	5·22	588	3·35	177	2·6	58	1·9	9·0	1·95	11
11	2·52	50·	5·0	533	3·25	158	2·55	53	1·9	9·0	1·95	11
12	2·6	58·0	4·9	510	3·27	164	2·57	56	1·9	9·0	1·93	10
13	2·6	58·	5·1	557	3·3	168	2·65	64	1·9	9·0	1·87	8
14	2·7	70·	5·1	630	3·25	158	2·67	67	1·9	9·0	1·85	6
15	2·75	76·	5·62	685	3·12	190	2·6	58	1·92	10		
16	2·87	92·	5·6	680	3·82	270	2·6	58	1·97	12·		
17	2·95	105	5·22	588	3·67	210	2·52	50	2·0	13·		
18	2·92	100·	4·97	527	3·17	200	2·47	46	2·02	11		
19	2·97	110	4·72	470	3·3	168	2·42	41	2·05	15		
20	3·00	112·	4·77	480	3·22	153	2·4	39	2·05	15		
21	3·00	112·	5·12	563	3·12	135	2·4	39	2·05	15		
22	3·12	127	5·0	533	3·07	126	2·37	37	2·0	13		
23	3·17	145	4·8	487	2·97	108	2·3	31	1·97	12·		
24	3·3	168·	4·72	470	2·87	93	2·3	31	1·87	8·0		
25	3·32	172·	4·57	433	2·8	82	2·3	31	1·85	7·2		
26	3·3	168·	4·5	416	2·75	76	2·3	31	1·85	7·2		
27	3·25	160·	4·47	410	2·7	70	2·27	30	1·85	7·2		
28	3·3	168·	4·4	391	2·67	67	2·25	27	1·82	6·4		
29	3·45	195·	3·3	372	2·6	58	2·22	26	1·8	5·5		
30	3·67	240·	4·02	310	2·6	58	2·2	24	1·8	5·5		
31			3·85	275			2·2	24	1·8	5·5		

MONTHLY DISCHARGE of Salmon River, at Woods' Ranch, near Grand Prairie, for 1912.
(Drainage area, 180 square miles.)

Month.	Discharge in Second-Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Run-Off. Depth in inches on Drainage area.	Total in acre-feet.	Rainfall. Inches.
April	240	9	88.3	0.49	0.55	5,254	
May	685	235	455	2.52	2.90	27,977	
June	270	58	159	0.88	0.98	9,461	
July	70	24	47.8	0.26	0.30	2,940	
August	21	5.5	12.[illegible]	0.07	0.08	735	
September	15	6	6	0.03	0.03	357	
The period	685	5.5	65	0.36	5.0	48,569	15

NOTE.—Mean for six summer months, 128 c.f.s. Station maintained during irrigation season. Winter conditions existed during December, January, February and March.
Accuracy, "A."

Salmon River, near Slahaltkan (303).—The station on Salmon river at Slahaltkan was established on May 23, 1911, by C. E. Richardson. The measuring section is located below the mouth of Bolean creek on the downstream side of the highway bridge at Slahaltkan, 10 miles east of Grand Prairie, on the road to the Okanagan. The gauge is a standard vertical staff fastened on the downstream side of the left abutment of the bridge. Measurements were made with a Price electric current meter and bridge equipment. The initial point for sounding is the left abutment of the bridge. The channel above and below the station is straight for 200 feet, and the water is fairly swift. The river is confined between the bridge abutments, and varies in depth from 1 foot to 6 feet. Three bench-marks were established and referred to the gauge datum.

The river is narrow below the station and trees overhang the banks. There is a chance of logs catching and the water being backed up the gauge. The station has been satisfactory, and the results are accurate.

DISCHARGE MEASUREMENTS of Salmon River, near Slahaltkan, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean Velocity.	Gauge Height.	Discharge.
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
[illegible] 23	C. E. Richardson	1618	29	96	4.4	2.7	422
[illegible] 23	C. G. Cline	1016	30	94	4.[illegible]	2.37	407
[illegible] 16	W. M. Carlyle	1044	30	74	[illegible]	1.[illegible]	2[illegible]
[illegible] 11	"	1044	30	64	2.8	1.50	17[illegible]
[illegible] 25	"	1044	30	44	1.[illegible]	1.04	72
[illegible] 19	"	1044	30	42	1.2	0.81	52
[illegible] 21	"	1044	29	42	1.2	0.80	49
1912.							
[illegible] 13	C. E. Richardson	1048	30	120	[illegible]	2.[illegible]	7[illegible]
[illegible] 16	"	1048	29	58	2.7	1.27	155
[illegible] 28	"	1049	24	34	1.5	0.80	51

DAILY GAUGE HEIGHT AND DISCHARGE OF

Day.	May. Gauge height	May. Discharge.	June. Gauge height	June. Discharge.	July. Gauge height	July. Discharge.	August. Gauge height	August. Discharge.
	Feet	Sec. ft.	Feet	Sec. ft.	Feet	Sec. ft.	Feet	Sec. ft.
1			2·45	441	1·31	135	·90	63·7
2			2·49	453	1·29	130	·89	62·[illegible]
3			2·38	420	1·24	122	·86	58·0
4			2·25	381	1·20	114	·85	56·6
5			2·15	352	1·18	110	·85	56·6
6			2·08	331	1·18	110	·81	50·9
7			2·02	315	1·19	112	1·00	78·7
8			1·96	298	1·64	211	1·05	87·[illegible]
9			1·91	284	1·65	214	·98	75·7
10			1·89	278	1·52	182	·92	66·7
11			1·86	270	1·52	182	·92	66·7
12			1·96	298	1·39	152	·90	63·7
13			1·94	292	1·32	137	·85	56·6
14			1·85	267	1·26	125	·82	52·[illegible]
15			1·75	240	1·25	124	·82	52·[illegible]
16			1·69	224	1·25	124	·84	50·9
17			1·64	211	1·20	114	·80	49·5
18			1·56	191	1·15	105	·80	49·5
19			1·51	17[illegible]	1·11	97	·80	49·5
20			1·45	166	1·09	94	·80	49·5
21			1·36	146	1·06	89	·80	49·5
22			1·41	156	1·05	87	·82	52·3
23	2·38	420	1·39	152	1·04	86	·82	52·3
24	2·30	396	1·39	152	1·01	80	·80	49·5
25	2·22	372	1·31	141	·98	76	·78	46·9
26	2·18	360	1·35	144	·98	76	·75	43·0
27	2·11	340	1·40	154	·96	73	·72	39·1
28	2·05	323	1·35	144	·94	70	·72	39·1
29	2·05	323	1·30	133	·92	67	·72	39·1
30	2·16	354	1·29	129	·91	65	·72	39·1
31	2·32	402			·90	64	·72	39·1

Salmon River, near Shahaltkon, for 1911.

September		October		November		December		
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge.	Gauge height	Discharge	Day.
Feet	Sec. ft.	Feet	Sec. ft.	Feet	Sec. ft.	Feet	Sec. ft.	
72	39.1	75	43.0	69	35.2	72	39.1	1
72	39.1	75	43.0	68	34.0	71	37.8	2
74	41.7	75	43.0	68	34.0	70	36.5	3
79	48.2	72	39.1	70	37.8	70	36.5	4
78	46.9	72	39.1	71	37.8	70	36.9	5
78	46.9	72	39.1	74	41.7	69	35.2	6
78	46.9	72	39.1	72	39.1	68	34.0	7
78	46.9	70	36.5	72	39.1	68	34.0	8
78	46.9	70	36.5	72	39.1	70	36.5	9
76	44.3	70	36.5	72	39.1	70	36.5	10
75	43.0	70	36.5	72	39.1	68	34.0	11
78	46.9	70	36.5	72	39.1	68	34.0	12
81	50.9	70	36.5	72	39.1	69	35.2	13
89	62.3	70	36.5	72	39.1	70	36.5	14
86	58.0	70	36.5	72	39.1	70	36.5	15
85	56.6	70	36.5	75	43.0	70	36.5	16
82	52.3	70	36.5	74	41.7	70	36.5	17
80	49.5	70	36.5	75	43.0	70	36.5	18
80	49.5	70	36.5	76	44.3	70	36.5	19
78	46.9	70	36.5	75	43.0	70	36.5	20
75	43.0	70	36.5	72	39.1	68	34.0	21
75	43.0	70	36.5	72	39.1	66	31.5	22
75	43.0	70	36.5	72	39.1	62	26.5	23
74	41.7	70	36.5	72	39.1	69	35.2	24
72	39.1	70	36.5	72	39.1	92	66.7	25
72	39.1	70	36.5	74	41.7	88	60.9	26
72	39.1	70	36.5	86	58.0	74	41.7	27
72	39.1	70	36.5	96	72.7	70	36.5	28
72	39.1	70	36.5	80	49.5	65	30.2	29
75	43.0	70	36.5	72	39.1	65	30.2	30
		70	36.5			70	36.5	31

MONTHLY DISCHARGE of Salmon River, near Shahaltkon, for 1911.
(Drainage area, 350 square miles.)

Month.	Discharge in Second-feet				Run-off		Rainfall
	Maximum	Minimum	Mean	Per sq. mile	Depth in inches on Drainage area	Total in acre-feet.	Inches
	453	120	245	70	78	14,600	
	214	61	114	33	38	7,010	
...ust	87	39	54	15	17	3,320	
...ember	62	39	46	13	14	2,740	
...tober	43	36	37	11	13	2,275	
...ember	73	34	41	12	13	2,440	
...ember	67	[illegible]	37	11	13	2,275	
The period							12

NOTE.—Partial winter conditions existed during November and December. Discharges are deduced ... a curve, applicable only to open flow conditions. The discharges given for these two months are ...fore probably slightly too large.
Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE OF

Day.	January Gauge height	January Discharge	February Gauge height	February Discharge	March Gauge height	March Discharge	April Gauge height	April Discharge	May Gauge height	May Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1	0.75	41.0	0.70	32.0	0.69	30.2	0.77	44.6	1.80	248
2	0.74	39.2	0.70	32.0	0.62	17.6	0.77	44.6	1.80	248
3	0.75	41.0	0.70	32.0	0.60	14.0	0.80	50.0	1.86	[illegible]
4	0.75	41.0	0.69	30.2	0.67	26.6	0.77	44.6	2.02	[illegible]
5	0.75	41.0	0.65	23.0	0.60	14.0	0.76	42.8	2.43	[illegible]
6	0.80	50.0	0.65	23.0	0.60	14.0	0.76	42.8	2.22	[illegible]
7	0.79	48.0	0.65	23.0	0.60	14.0	0.73	37.4	2.33	[illegible]
8	0.75	41.0	0.65	23.0	0.62	17.6	0.76	42.8	2.53	[illegible]
9	0.80	50.0	0.67	26.6	0.62	17.6	0.81	51.7	2.65	[illegible]
10	0.80	50.0	0.70	32.0	0.62	17.6	0.83	55	2.67	[illegible]
11	0.80	50.0	0.67	26.6	0.62	17.6	0.93	73	2.70	[illegible]
12	0.80	50.0	0.70	32.0	0.62	17.6	0.98	84	2.85	[illegible]
13	0.70	32.0	0.70	32.0	0.62	17.6	0.97	80	2.96	[illegible]
14	0.67	26.6	0.70	32.0	0.60	14.0	1.00	85	3.22	[illegible]
15	0.70	32.0	0.70	32.0	0.60	14.0	1.05	94	3.35	[illegible]
16	0.70	32.0	0.70	32.0	0.60	14.0	1.05	94	3.45	[illegible]
17	0.70	32.0	0.67	26.6	0.60	14.0	1.07	98	3.42	[illegible]
18	0.70	32.0	0.67	26.6	0.60	14.0	1.16	114	3.25	[illegible]
19	0.70	32.0	0.67	26.6	0.60	14.0	1.20	122	3.20	[illegible]
20	0.70	32.0	0.67	26.6	0.60	14.0	1.20	122	3.20	[illegible]
21	0.70	32.0	0.67	26.6	0.60	14.0	1.25	132	3.20	[illegible]
22	0.70	32.0	0.67	26.6	0.60	14.0	1.36	154	3.20	[illegible]
23	0.70	32.0	0.67	26.6	0.60	14.0	1.40	162	3.20	[illegible]
24	0.70	32.0	0.67	26.6	0.65	23.0	1.50	182	3.15	[illegible]
25	0.80	50.0	0.65	23.0	0.72	35.6	1.55	192	3.05	[illegible]
26	0.74	39.2	0.65	23.0	0.73	37.4	1.57	196	2.86	[illegible]
27	0.67	26.6	0.64	[illegible]	0.77	44.6	1.57	196	2.70	[illegible]
28	0.67	26.6	0.66	24.8	0.80	50.0	1.60	203	2.57	[illegible]
29	0.70	32.0	0.70	32.0	0.73	37.4	1.60	203	2.50	[illegible]
30	0.80	50.0			0.71	33.8	1.72	230	2.47	[illegible]
31	0.72	35.6			0.76	42.8			2.37	[illegible]

Salmon River, near Shahaltkan, for 1912.

June		July		August		September		Day
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	
2.25	372	1.25	132	0.96	80	0.87	62	1
2.17	347	1.30	142	0.96	78	0.90	67	2
2.10	326	[illegible]	150	0.95	76	0.90	67	3
2.02	[illegible]	1.30	[illegible]	0.95	76	0.90	67	4
[illegible]	277	[illegible]	[illegible]	0.96	76	0.87	62	5
1.86	262	1.30	[illegible]	0.93	72	0.87	63	6
[illegible]	[illegible]	[illegible]	152	0.90	67	[illegible]	[illegible]	7
1.76	248	1.30	142	0.88	64	[illegible]	[illegible]	8
1.72	[illegible]	1.24	136	0.90	67	0.90	67	9
1.70	225	[illegible]	128	0.88	64	0.87	63	10
[illegible]	218	1.25	[illegible]	0.87	63	0.87	62	11
1.68	221	1.25	138	0.87	62	0.87	63	12
1.72	230	1.30	[illegible]	0.87	63	0.87	62	13
1.80	248	1.30	142	0.86	60			14
[illegible]	298	1.28	[illegible]	0.86	60			15
1.90	272	1.26	134	0.90	67			16
1.85	260	[illegible]	[illegible]	0.90	67			17
1.77	211	1.18	118	0.90	67			18
1.65	214	1.16	114	0.88	64			19
1.58	199	1.11	105	0.87	63			20
1.55	192	1.10	103	0.87	62			21
1.50	182	1.10	103	0.87	62			22
1.47	176	1.08	99	0.87	63			23
1.40	162	1.08	[illegible]	[illegible]	[illegible]			24
1.32	146	[illegible]	[illegible]	[illegible]	[illegible]			25
1.30	142	1.10	103	[illegible]	[illegible]			26
1.27	136	1.07	98	0.84	59			27
1.24	130	1.05	94	0.80	50			28
1.20	122	1.02	89	[illegible]	46			29
1.25	132	0.98	81	0.84	52			30
		0.97	80	0.86	60			31

MONTHLY DISCHARGE of Salmon River, near Slahaltkan, for 1912.
(Drainage area, 350 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	50	27	38	·11	·13	2,340	
February	32	21	28	·08	·09	1,610	
March	45	14	22	·06	·07	1,350	
April	230	37	109	·31	·35	6,490	
May	1,075	248	646	1·85	2·13	39,700	
June	372	122	225	·64	·71	13,400	
July	152	80	120	·34	·39	7,380	
August	80	46	63	·18	·21	3,870	
The period							16

NOTE.—Partial winter conditions existed during January and February. Discharges are deduced from a curve, applicable only to open flow conditions. The discharges given for these two months are therefore, probably slightly too large. Accuracy, "C."
Station abandoned September 13, 1912.
From March to August, Accuracy "A."

Salmon River, near Salmon Arm (304).—The station on Salmon river at Salmon Arm was established on June 2, 1911, by C. E. Richardson. The measuring section is located on the downstream side of the new bridge at Vavasour's ranch, 4 miles from Salmon Arm and 3 miles from the mouth of the river. The gauge is a standard vertical staff fastened to a pile on the left end of the downstream side of the bridge. Measurements are made with a Price small electric meter and bridge equipment during high water, and by wading during low water. The initial point for sounding is at the right abutment on the downstream side of the bridge. The channel above and below the station is straight for 150 feet and the water is not very swift. The water passes between the bridge abutments at all stages, and is from 2 feet to 7 feet deep. The bed of the stream is silt, and has a tendency to shift. The water flows diagonally under the bridge, but the flow is fairly uniform. Three bench-marks were established and referred to the gauge datum.

DISCHARGE MEASUREMENTS of Salmon River, near Salmon Arm, 1911-12.

Date.	Hydrographer.	Meter No	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
June 2	C. E. Richardson	1048	170	483	1·6	1·4	[illegible]
June 12	"	1048	125	321	1·7	3·47	[illegible]
June 27	"	1048	80	162	2·0	1·85	[illegible]
Aug. 1	"	1048	42	59	1·7	0·40	[illegible]
Aug. 30	"	1048	40	35	1·5	0·15	[illegible]
Oct. 5	"	1048	40	37	1·6	0·10	[illegible]
1912.							
May 19	"	1055	75	416	2·5	4·35	1,0[illegible]
June 14	"	1048	82	184	2·4	2·10	[illegible]
Sept. 6	"	1049	45	51	1·7	0·19	[illegible]

Daily Discharge of Salmon River, near Salmon Arm, for 1911.

Day.	June.	July.	August.	September.	October.	November.
	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1	600	271	91·0	56·9	55·8	47·0
2	600	240	86·2	55·8	52·5	47·0
3	600	222	85·0	52·5	52·5	47·0
4	645	203	83·8	53·6	52·5	47·0
5	611	193	79·0	66·0	52·5	47·0
6	560	183	81·4	68·0	52·5	49·2
7	558	193	125	68·0	52·5	60·0
8	523	240	151	68·0	52·5	58·0
9	514	340	128	52·5	52·5	55·8
10	514	317	101	63·0	52·5	52·5
11	532	312	95·8	58·0	49·2	
12	571	268	91·0	55·8	49·2	
13	578	225	86·2	63·9	49·2	
14	584	207	81·4	76·8	52·5	
15	532	189	79·0	88·6	49·2	
16	474	182	79·0	79·0	49·2	
17	406	171	76·8	73·5	49·2	
18	371	157	74·6	68·0	49·2	
19	340	149	70·2	68·0	49·2	.....
20	328	142	76·8	68·0	49·2	
21	303	136	68·0	66·0	49·2	
22	290	128	68·0	63·0	49·2	
23	283	127	68·0	63·0	49·2	
24	279	123	68·0	58·0	49·2	
25	271	118	66·0	58·0	49·2	....
26	258	115	63·0	58·0	47·0	....
27	290	113	63·0	58·0	47·0	....
28	263	105	64·0	58·0	47·0	....
29	243	103	63·0	58·0	47·0	....
30	240	93	63·0	58·0	47·0	....
31		91	58·0	...	47·0	....

Monthly Discharge of Salmon River, near Salmon Arm, for 1911.
(Drainage area, 530 square miles.)

Month.	Discharge in Second-Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Run-Off. Depth in inches on Drainage area.	Total in acre-feet.	Rain-fall. Inches.
June	645	240	439	·83	·93	26,100	
July	340	91	182	·34	·39	11,200	
August	151	58	82	·15	·17	5,050	
September	89	53	63	·12	·13	3,750	
October	56	47	50	·09	·10	3,075	
The period							15

Note.—River froze about November 10, 1911, and opened again March 24, 1912. Channel at station shifted at the time of the May flood, 1912, and a new curve was made for all discharges subsequent to May 1, 1912.

Accuracy, "B."

DAILY DISCHARGE of Salmon River, near Salmon Arm, for 1912.

Day.	March.	April.	May.	June.	July.	August.	September.
	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1	...	87	402	651	209	105	86
2	...	90	410	624	223	100	122
3	...	110	402	579	216	96	109
4	...	122	432	542	253	91	101
5	...	113	463	524	232	84	100
6	...	111	483	492	237	73	91
7	...	110	512	463	246	73	113
8	...	113	569	471	251	73	131
9	...	128	637	463	232	73	136
10	...	143	710	441	211	68	109
11	...	171	720	424	195	73	87
12	...	190	745	432	214	73	82
13	...	183	795	443	216	68	82
14	...	178	865	419	216	64	73
15	...	170	967	461	204	68	69
16	...	168	1,070	532	195	77	64
17	...	170	1,075	473	184	75	61
18	...	186	1,028	443	173	75	61
19	...	192	1,009	414	158	73	59
20	...	193	1,005	386	154	73	57
21	...	201	1,014	331	145	73	55
22	...	207	1,028	303	136	68	55
23	...	216	1,032	260	145	64	55
24	21·2	235	1,070	241	141	64	59
25	21·2	252	1,028	237	145	66	59
26	39·4	260	1,005	237	167	60	6
27	61·8	263	997	237	151	59	64
28	73·0	265	902	230	145	59	60
29	87·5	267	828	219	136	59	60
30	77·2	298	762	214	127	59	60
31	83·0		688	...	109	68	

MONTHLY DISCHARGE of Salmon River, near Salmon Arm, for 1912.

(Drainage area, 530 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain Fall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inch
April	298	87	179	·34	·38	10,650	
May	1,075	102	796	1·50	1·73	48,950	
June	654	214	407	0·77	0·86	24,200	
July	253	109	187	·35	·40	11,500	
August	105	59	73	·14	16	4,500	
September	136	5	80	·15	·17	4,750	..
The period			..		...		

NOTE.—River opened about March 24, 1912. Station abandoned September 30, 1912
Accuracy, "B."

Scottie Creek (219).

Scottie creek has its source in the Arrowstone hills, at an elevation of 5,000 feet, and discharges into Bonaparte river from the east, near the 19-mile post on the Cariboo road, at an elevation of 1,600 feet. It is part of the Thompson-Fraser drainage. The drainage area above the mouth is 73 square miles, and the gauging station is near the mouth. The water is used for irrigation, and the supply is usually insufficient. Water from Scottie creek was used for placer mining at one time.

The drainage basin of Scottie creek is very rough, with no agricultural land. There are canyons on the streams in places, and the fall is quite heavy. There is a wagon road for only half a mile up the creek, with a pack trail for several miles farther. There was a placer mine in the valley at one time, but it has been abandoned. There are indications of mineral in the vicinity. There is some timber in the valley, but it is mostly small, and its main use would be to conserve the moisture and prevent erosion. Most of the land in the watershed will be used for nothing but grazing.

At one of the canyons a storage dam might be constructed to store the surplus flood waters for use in the latter part of the irrigation season. The canyon is said to be 30 feet deep and 20 feet wide, with a good basin behind it.

Scottie creek is in the Dry Belt. The precipitation is from 8 to 10 inches. The weather is hot in summer and cold in winter.

The gauge on Scottie creek is near the mouth, just above Mr. Walker's diversion. Since the station was established, Mr. Hunter has dug a ditch above it, and was diverting water through it during part of July and August, 1912. The station was established on June 6, 1911, and the gauge readings were taken twice a day during the irrigation seasons of 1911 and 1912 by M. F. Ahearn. The gauge is a 5-foot cedar staff, securely nailed to a tree stump on the left bank of the creek about 200 feet above Walker's diversion and just behind Hunter's stable. The meter measurements are made by wading at a section 50 feet below the gauge. The stream above the section is rapid, and below the section it is backed up by the diversion dam. The banks are high enough to prevent overflowing, and are covered with bushes. The bed of the stream is rocky in the rapids, with a deposit of mud in the quieter water at the dam. The influence of the dam does not extend to the gauge. It is hard to read the gauge accurately at high water. The general level of the water near the gauge should be taken, not the point to which the water backs up. The bank is undercut at the gauge, but it does not seem to affect the accuracy.

Discharge Measurements of Scottie Creek, above diversions, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
June 6	C. G. Cline.	1046	12·5	6·9	0·9	0·60	6·0
July 16	"	1046	9·0	1·2	0·6	0·44	2·5
Sept. 28	Cline and Smith.	1046	12·	5·6	0·7	0·50	3·8
1912.							
Apr. 25	C. G. Cline.	1016	10·	7·6	1·3	0·95	10·2
May 10	"	1046	23·	16·3	2·0	1·60	33·
May 13	"	1046	23·	14·8	1·8	1·40	26·
June 19	Corbould and Cline	1046	11·	1·5	1·2	0·60	5·7
July 10	B. Corbould	1014	11·8	5·5	1·3	0·70	7·4
Aug. 2	"	1941	6·5	5·3	1·0	0·55	5·3
Aug. 28	"	1044	9·5	3·6	0·9	0·45	3·0

GAUGE HEIGHTS AND DAILY DISCHARGE of Scottie Creek, above diversions, for 1911.

Day.	June.		July.		August.		September.		October.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	......	5·8	0·55	4·8	0·4	2·0	......	3·1	......	3·8
2	......	5·8	......	4·3	......	2·3	......	3·2	......	3·8
3	......	5·8	0·5	3·8	......	2·6	......	3·4	0·5	3·8
4	......	5·8	0·5	3·8	......	2·9	......	3·6	......	3·8
5	......	5·8	0·48	3·4	......	3·2	0·5	3·8	......	3·8
6	0·6	5·8	0·49	3·6	......	3·4	......	3·5	......	4·0
7	0·6	5·8	......	3·7	......	3·6	......	3·2	......	3·9
8	0·6	5·8	0·5	3·8	0·5	3·8	......	2·9	......	3·9
9	0·6	5·8	0·5	3·8	0·5	3·8	......	2·6	......	1·0
10	0·6	5·8	......	3·6	......	3·5	......	2·4	......	4·0
11	0·6	5·8	......	3·4	......	3·2	......	2·2	0·51	4·0
12	0·57	5·2	......	3·2	......	2·9	0·4	2·0	......	4·1
13	0·57	5·2	......	3·0	......	2·6	......	2·2	......	4·2
14	0·55	4·8	......	2·8	0·42	2·4	......	2·4	......	4·3
15	0·52	4·2	......	2·6	[illegible]	2·0	......	2·6	......	4·4
16	0·5	3·8	......	2·4	......	2·2	......	2·9	......	4·5
17	0·5	3·8	......	2·2	......	2·4	......	3·2	0·54	4·6
18	0·5	3·8	......	2·1	......	2·6	......	3·5	......	4·6
19	0·	3·8	0·4	2·0	......	2·8	0·5	3·8	......	4·6
20	......	3·8	......	2·0	......	3·0	......	3·8	......	4·7
21	0·5	3·8	......	2·0	......	3·2	......	3·8	......	4·7
22	0·5	3·8	......	1·9	......	3·5	......	3·8	......	4·7
23	0·5	3·8	......	1·9	0·5	3·8	......	3·8	......	3·8
24	0·5	3·8	......	1·8	......	3·6	......	3·8	0·55	4·8
25	0·5	3·8	......	1·8	......	3·4	......	3·8	......	4·4
26	0·5	3·8	0·38	1·7	......	3·3	......	3·8	......	1·0
27	0·5	3·8	......	1·7	......	3·2	0·5	3·8	......	3·6
28	0·5	3·8	......	1·7	......	3·1	......	3·8	......	3·2
29	0·55	4·8	......		......	3·0	......	3·8	......	2·8
30	0·55	4·8	......		0·45	2·9	......	3·8	......	2·4
31	...	.....	......		......	3·0	..	......	0·4	2·0

MONTHLY DISCHARGE of Scottie Creek, above diversions, for 1911.

(Drainage area, 70 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rain-fall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
June	5·8	3·8	4·7	0·07	0·08	280	
July	4·8	1·7	2·7	0·04	0·05	166	
August	3·8	2·0	3·0	0·04	0·05	184	
September	3·8	2·0	3·3	0·05	0·06	196	
October	4·8	2·0	4·0	0·06	0·07	246	
The period							10

NOTE.—Station established June 6, and maintained during irrigation season only.
Accuracy, "C."

GAUGE HEIGHTS AND DAILY DISCHARGE of Scottie Creek, above diversions, for 1912.

Day	April.		May.		June.		July.		August.		September.	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec. ft
1.	0·7	7·8		19·0	..	10·5	0·77	9·2	..	5·0	0·47	3·3
2.		7·8	1·2	20·0		10·1		8·7	0·55	4·8		
3.		7·8		23·0	0·8	9·8		8·2		5·1		
4.		7·8	1·4	26·0		9·3	0·7	7·8		5·4		
5.		7·8		27·5		8·8		7·8	0·6	5·8	0·6	5·8
6.		7·8	1·5	29·0		8·3		7·8		5·4		
7.		7·8		35·0	0·7	7·8		7·8		4·6		
8.	0·7	7·8	1·45	40·0		7·8	0·7	7·8	0·5	3·8	0·5	3·8
9.		8·5	1·9	45·0		7·8		7·8		3·8		
10.		9·2		37·0	0·7	7·8	0·7	7·8		3·8		
11.	0·8	9·8	1·5	29·0		7·8	0·57	5·2	0·5	3·8		
12.		9·8		28·2	0·7	7·8		5·4		4·3		
13.		9·8	1·45	27·5		8·0		5·6		4·8		
14.		9·8		26·8	0·72	8·2		5·7		5·3		
15.	0·8	9·8	1·4	26·0		8·1	0·6	5·8	0·6	5·8		
16.		10·0		23·0		8·0		5·3	..	5·4		
17.		10·2		20·0	0·7	7·8		4·8		5·1		
18.		10·4		17·9		6·8		4·3	0·55	4·8		
19.		10·6	1·0	14·0	0·6	5·8	0·5	3·8		4·8		
20.		10·7	1·0	14·0		5·0		4·3		4·8		
21.		10·8		15·0		6·4		4·8		4·8		
22.	0·85	10·9		16·0	0·65	6·8		5·3	0·55	4·8		
23.		11·6	1·1	17·0		6·3	0·6	5·8		4·8		
24.		12·3		16·0	0·6	5·8		6·1	0·55	4·8		
25.	0·95	13·0		14·0		6·3		6·5	0·5	3·8		
26.		14·0		13·0		6·8	0·65	6·8		3·7		
27.		15·0	0·9	12·0		7·3		6·5		3·6		
28.		16·0		11·6	0·7	7·8		6·1		3·5		
29.	1·1	17·0		11·2		8·3	0·6	5·8	0·47	3·3		
30.		18·0	0·85	10·9		8·8	..	5·5		3·3		
31.				10·5			..	5·2		3·3		

MONTHLY DISCHARGE of Scottie Creek, above diversions, for 1912.

(Drainage area, 70 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	18·0	7·8	10·6	0·15	0·17	630	
May	45·0	10·5	21·7	0·31	0·36	1,330	
June	10·5	5·8	7·8	0·11	0·12	464	
July	9·2	3·8	6·3	0·09	0·10	387	
August	5·8	3·3	4·5	0·06	0·07	277	
The period							10

Note.—Station maintained during irrigation season only.
Accuracy, "C."

SHUSWAP RIVER (311).

Shuswap river has its source 30 miles east of Armstrong, B.C., at an elevation of 1,980 feet in Sugar lake, which is fed by tributaries rising in the Park mountains of the Gold range, at an elevation of 6,000 feet. This river is about 100 miles long and discharges into Shuswap lake near Sicamous, at an elevation of 1,150 feet.

One-half mile above the mouth the river broadens into Mara lake, a lake about 8 miles long and three-quarters of a mile wide. From Mara lake to 1 mile above Enderby, a distance of 15 miles, the river is very sluggish. Between Enderby and Mabel lake there are several rapids, and a total fall of 100 feet. Mabel lake, at an elevation of 1,270 feet, is about 25 miles long and over one-half mile in width. Above Mabel lake there are a series of rapids and one pronounced fall (Coteau falls). The distance between Mabel lake and Sugar lake is about 30 miles, and the fall is over 600 feet. Sugar lake is about 3½ miles long and 1½ miles wide.

The precipitation in the Shuswap drainage varies from 20 inches at the mouth to 30 inches near the source. The winter conditions near the mouth are mild, but at the source they are severe, with a large fall of snow. The river freezes for about three months during the winter.

Logging is the most important interest on the stream, a large saw-mill concern at Enderby (Rogers, Ltd.) owns extensive limits around Mabel lake.

At present no power is developed on Shuswap river. However, at Coteau falls, the C.N.R. is constructing a power plant which, when completed, will develop 9,000 horse-power. Good storage may be obtained on Sugar lake. Another possible development which has been investigated is located about 3 miles below Mabel lake. A head of from 30 feet to 40 feet may be obtained, and there is good storage. The mean flow of Shuswap river at this point is about 3,000 c.f.s.

Navigation is carried on between Enderby and the mouth, and during high water large vessels may ply between Enderby and Sicamous and on through Shuswap lake to Kamloops.

The drainage area of the river above the mouth is 1,700 square miles and above Enderby 1,600 square miles.

A regular gauging station was established on Shuswap river on August 25, 1911, at Enderby, B.C., by C. E. Richardson. The gauge is a vertical staff, 16 feet long, fastened to the abutment piles of the traffic bridge. Measurements are made by boat. The conditions are satisfactory for accurate results.

DISCHARGE MEASUREMENTS of Shuswap River, near Enderby, B.C., 1911-12.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Disch
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec
1911.							
Aug. 25	C. E. Richardson	1048	212	2,120	0·9	4·08	1
Oct. 7	"	1048	205	1,890	0·7	3·15	1
1912.							
Feb. 28	C. E. Richardson	1047	180	1,680	0·4	1·90	
May 20	"	1048	283	4,970	2·3	10·65	11
June 16	"	1018	355	5,550	2·4	12·06	13
July 13	"	1048	275	3,760	1·7	7·34	6
Sept. 7	"	1048	245	3,160	1·1	4·6	3
Oct. 5	"	1055	210	1,710	1·0	3·55	1

*Cable Station.
†Bridge Station.

DAILY GAUGE HEIGHT AND DISCHARGE of Shuswap River, near Enderby, for 1911.

Day.	August.		September.		October.		November.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			3·70	1,730	3·37	1,459	2·65	910
2			3·65	1,685	3·35	1,445	2·50	880
3			3·62	1,658	3·3	1,410	2·50	880
4			3·65	1,685	3·25	1,375	2·50	880
5			3·65	1,685	3·22	1,354	2·55	910
6			3·60	1,640	3·20	1,310	2·60	940
7			3·55	1,600	3·15	1,300	2·60	940
8			3·55	1,600	3·10	1,260	2·55	910
9			3·50	1,566	3·10	1,260	2·50	880
10			3·47	1,536	3·05	1,225	2·50	880
11			3·30	1,410	3·0	1,190		
12			3·30	1,410	3·0	1,190		
13			3·22	1,354	2·95	1,155		
14			3·35	1,445	3·0	1,190		
15			3·65	1,685	3·0	1,190		
16			3·65	1,685	2·97	1,169		
17			3·6	1,640	2·95	1,155		
18			3·6	1,640	2·9	1,120		
19			3·6	1,640	2·9	1,120		
20			3·57	1,616	2·85	1,090		
21			3·60	1,640	2·82	1,072		
22			3·58	1,624	2·80	1,060		
23			3·55	1,600	2·80	1,060		
24			3·50	1,560	2·77	1,042		
25	4·0	2,000	3·55	1,600	2·75	1,030		
26	4·0	2,000	3·17	1,536	2·70	1,000		
27	3·95	1,955	3·45	1,520	2·70	1,000		
28	3·9	1,910	3·42	1,496	2·67	982		
29	3·85	1,866	3·40	1,480	2·65	970		
30	3·80	1,820	3·37	1,459	2·60	940		
31	3·75	1,775			2·60	940		

MONTHLY DISCHARGE of Shuswap River, near Enderby, for 1911.

(Drainage area, 1,600 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rainfall.
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
September	1,730	1,354	1,580	·99	1·10	94,000	
October	1,460	940	1,160	·73	·84	71,300	
period							·30

NOTE.—Station established Aug. 25, 1911. River frozen up, Nov. 11, 1911.
Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	March.		April.		May.		June.		July.	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1.	2·3	780	2·25	755	6·5	4,960	11·55	12,580	9·4	9,210
2	2·3	780	2·4	830	6·5	4,960	11·15	11,940	9·2	8,900
3	2·3	780	2·9	1,120	6·5	4,960	10·7	11,220	9·0	8,600
4	2·3	780	2·8	1,060	6·55	5,020	10·3	10,600	8·7	8,150
5	2·32	790	2·8	1,060	6·7	5,220	10·0	10,130	8·4	7,700
6	2·32	790	2·75	1,030	6·7	5,220	9·7	9,680	8·3	7,550
7.	1·9	590	2·7	1,000	6·7	5,220	9·6	9,530	8·1	7,250
8	1·9	590	2·8	1,060	7·0	5,630	9·65	9,600	8·0	7,100
9	1·9	590	3·0	1,190	7·3	6,060	9·9	9,980	7·75	6,720
10	1·8	550	3·2	1,340	7·4	6,200	10·0	10,130	7·5	6,350
11	1·65	490	3·6	1,640	7·6	6,500	10·2	10,450	7·4	6,200
12	1·65	490	4·0	2,000	7·8	6,800	10·5	10,900	7·3	6,060
13	1·65	490	4·1	2,100	8·0	7,100	11·1	11,860	7·35	6,130
14	1·7	510	4·2	2,200	8·4	7,700	11·4	12,340	7·3	6,060
15	1·7	510	4·3	2,300	8·9	8,450	11·7	12,820	7·2	5,910
16	1·7	510	4·4	2,400	9·4	9,210	12·1	12,460	7·1	5,770
17	1·7	510	4·6	2,600	9·9	9,980	12·3	13,780	7·0	5,630
18	1·7	510	4·8	2,810	10·2	10,450	12·3	13,780	6·9	5,490
19	1·7	510	5·3	3,390	10·5	10,900	12·3	13,780	6·75	5,280
20.	1·7	510	5·6	3,760	10·6	11,060	12·3	13,780		5,080
21	1·7	510	5·7	3,890	10·9	11,540	12·1	13,460	6·45	4,890
22	1·7	510	5·8	4,020	11·1	11,860	12·1	13,460		4,680
23	1·7	510	5·9	4,150	11·2	12,020	11·9	13,140	6·15	4,480
24	1·7	510	6·1	4,410	11·4	12,340	11·7	12,820		4,410
25	1·7	510	6·2	4,540	11·6	12,660	11·5	12,500	6·1	4,410
26	1·7	510	6·2	4,540	11·9	13,140	11·2	12,020		4,320
27	1·7	510	6·2	4,540	12·1	13,460	10·8	11,380	5·95	4,220
28	1·7	510	6·2	4,540	12·3	13,780	10·6	11,060		4,090
29.	2·0	630	6·25	4,610	12·3	13,780	10·2	10,450	5,75	3,960
30	2·0	630	6·5	4,960	12·2	13,620	9·8	9,830		3,830
31	2·1	680			11·95	13,220			5·55	3,700

of Shuswap River, near Enderby, for 1912.

August.		September.		October.		November.		December.		
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Day.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
	3,600	4·4	2,400	3·6	1,640		1,660		1,540	1
5·4	3,510		2,450		1,600	3·6	1,640	3·45	1,520	2
	3,450	4·5	2,500	3·5	1,560		1,640		1,520	3
5·3	3,390		2,150		1,580	3·6	1,640	3·45	1,520	4
	3,330	4·4	2,400	3·55	1,600		1,620		1,500	5
5·2	3,270		2,500		1,540	3·55	1,600	3·4	1,480	6
	3,210	4·6	2,600	3·4	1,480		1,600		1,440	7
5·1	3,150		2,650		1,180	3·55	1,600	3·3	1,410	8
	3,090	4·7	2,700	3·4	1,480		1,580		1,390	9
5·0	3,030		2,650		1,180	3·5	1,560	3·25	1,370	10
	3,030	4·6	2,600	3·4	1,480		1,560		1,360	11
5·0	3,030		2,580		1,480	3·5	1,560	3·2	1,310	12
	2,980	4·55	2,550	3·4	1,180		1,620		1,300	13
4·9	2,920		2,520		1,160	3·65	1,680	3·1	1,260	14
	2,920	4·5	2,500	3·35	1,410		1,660		1,260	15
4·9	2,920		2,480		1,500	3·6	1,640	3·1	1,260	16
	2,890	4·45	2,150	3·5	1,560		1,600		1,220	17
4·85	2,860		2,380		1,600	3·5	1,560	3·0	1,190	18
	2,840	4·3	2,300	3·6	1,640		1,600		1,180	19
4·8	2,810		2,280		1,680	3·6	1,610	2·95	1,160	20
	2,760	4·25	2,250	3·7	1,730		1,660		1,140	21
4·7	2,700		2,150		1,760	3·65	1·680	2·9	1·120	22
	2,620	4·05	2·050	3·75	1,780		1·660		1·100	23
4·55	2,550		2,000		1,780	3·6	1·640	2·85	1·090	24
	2,520	3·95	1,960	3·75	1,780		1,640		1,090	25
4·5	2,500		1,840		1,780	3·6	1·640	2·85	1,030	26
	2,480	3·8	1,820	3·75	1,780		1,600		1,060	27
4·45	2,450		1,780		1,760	3·5	1,560	2·75	1,030	28
	2,420	3·7	1,730	3·7	1,730		1,560		1,040	29
4·4	2,400		1,680		1,700	3·5	1,560	2·8	1·060	30
	2,400			3·65	1,680				1,030	31

MONTHLY DISCHARGE of Shuswap River, near Enderby, for 1912.

(Drainage area, 1,600 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area	Total in acre-feet.	Inch
March	790	490	585	·37	·13	36,000	
April	4,960	755	2,660	1·66	1·85	158,300	
May	13,780	4,960	9,130	5·71	6·58	561,000	
June	13,780	9,530	11,750	7·34	8·19	699,000	
July	9,210	3,700	5,880	3·68	4·21	362,000	
August	3,600	2,100	2,900	1·81	2·09	78,300	
September	2,700	1,680	2,310	1·41	1·61	137,500	
October	1,780	1,410	1,615	1·01	1·16	99,300	
November	1,680	1,560	1,615	1·00	1·12	96,100	
December	1,510	1,030	1,260	0·79	0·91	77,500	
The period							

NOTE.—The ice went out on February 28, 1912. Open to end of 1912. Accuracy, "A."

SILVER HOPE CREEK (120 AND 121.)

Silver Hope creek has its source in the mountains 15 miles south of Hope, at elevation of from 2,000 to 3,000 feet, and discharges into Fraser river near Hope, an elevation of 100 feet. It is part of the Fraser drainage. The drainage area, measured from a Dominion sectional map, scale 3 miles to an inch, is 80 square mi The precipitation varies from 50 inches, at the mouth, to 80 inches or more in t upper section of the watershed, where the winters are severe, with much snow. A present a very small amount of water from this creek is used for irrigation; there some good land along the Fraser near the mouth of the creek, but with that except there is little agricultural land in the Silver Hope valley, and none is taken up. T hillsides are very steep, which tends to give a rapid run-off, with small loss by evapo tion and seepage. The creek is swift, with many rapids, but the fall is unifor distributed through its whole length.

The creek is fairly well controlled by Silver lake, about 5 miles from the m at an altitude of 1,100 feet. The lake has an area of 160 acres, and would aff suitable reservoir for power development. Silver Hope creek is a poor power pro tion, when compared with others in the same district still undeveloped.

Attempts have been made to build a railroad up the valley, but the grade found to be too steep. The Pacific Highway, however, is now being built through valley, and will give easy access to this district, which is unrivalled in its prim beauty.

In establishing a gauging station on Silver Hope creek, it was found most venient to locate the station at a point where an island divides the creek int channels, necessitating the use of two gauges, one on each branch. The sum o discharges of the two branches represents the total flow of Silver Hope creek station was established November 17, 1911, by C. G. Cline. It is located one mile from the mouth, and one-quarter mile above the C.N.R. bridge. Vertical gauges are located on both branches; on the left branch the gauge is fastened t left abutment of the highway bridge on the upstream side; on the right branch the gauge is fastened to a tree on the right bank 100 feet below the highway bridge. The measuring section on the right branch is 5 feet below the gauge; a tree was felled across the stream, and cable measurements are taken from it. The measuring section on the left branch is at the bridge during high water, when cable measurements are made; during lower water wading measurements are made 100 feet below the bridge.

DISCHARGE MEASUREMENTS of Silver Hope Creek, one half mile from mouth, 1911-12.

Date	Hydrographer	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
			Feet	Sq. ft.	Ft. per sec.	Feet	Sec. ft.
1911.	*Right Branch.*						
Dec. 11	K. H. Smith	1057	13	57.1	3.4	2.1	196
	Left Branch.						
Dec. 11	K. H. Smith	1057	40	52	3.4	1.0	177
1912.	*Right Branch.*						
Mar. 1	C. G. Cline	1046	35	74	1.9	1.90	117
June 7	"	1046	38	127	6.0	3.50	765
Sept. 17	"	1046	32	61	1.8	1.73	108
Nov. 19	"	1048	40	131	1.9	3.35	652
Dec. 7	"	1048	32	81	2.4	2.25	194
	Left Branch.						
Mar. 1	C. G. Cline	1046	30	56	1.0	0.55	54.1
June 7	"	1046	41	82	4.1	1.70	335
Sept. 7	"	1046	31	30	0.8	0.90	25
Nov. 19	"	1048	41	65	3.3	1.35	216
Dec. 7	"	1048	39	37	1.2	0.48	43

NOTE.—Silver Hope creek was metered in two branches called right and left branch.

DAILY DISCHARGE of Silver Hope Creek, one-half mile from mouth, for 1911.

Day	November	December
	Discharge.	Discharge.
	Sec.-ft.	Sec.-ft.
1		304
2		293
3		274
4		274
5		255
6		255
7		255
8		371
9		476
10		409
11		359
12		347
13		304
14		274
15		274
16		255
17	335	238
18	1,750	222
19	1,261	222
20	1,003	214
21	753	207
22	558	255
23	436	384
24	359	304
25	409	255
26	576	238
27	436	222
28	359	207
29	344	185
30	293	178
31		178

MONTHLY DISCHARGE of Silver Hope Creek, one-half mile from mouth, for 191

(Drainage area, 80 square miles.)

Month.	Discharge in Second Feet.				Run-Off.		
	Maximum.	Minimum.	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	
November	1,750	293	(estimated) 500	6·3	7·0	29,750	
December	476	178	274	3·4	3·9	16,850	
The period							

NOTE.—These data are arrived at by summing the figures obtained from rating curves on the and the left branches of Silver Hope creek. These stations were not established till the mid November, so that the totals obtained for the month of November are merely an approximation.
Accuracy, "A."

Daily Discharge of Silver Hope Creek, one-half mile from mouth, for 1912.

Day.	January. Discharge. Sec.-ft.	February. Discharge. Sec.-ft.	March. Discharge. Sec.-ft.	April. Discharge. Sec.-ft.	May. Discharge. Sec.-ft.	June. Discharge. Sec.-ft.	July. Discharge. Sec.-ft.	August. Discharge. Sec.-ft.	September. Discharge. Sec.-ft.	October. Discharge. Sec.-ft.	November. Discharge. Sec.-ft.	December. Discharge. Sec.-ft.
1	177	436	188	233	356	572	442	227	242	117	148	259
2	171	371	188	289	356	687	744	222	212	117	141	259
3	168	347	183	297	365	586	600	204	217	123	139	367
4	154	304	183	297	365	646	501	199	189	155	139	375
5	166	284	183	278	279	815	566	186	169	146	139	349
6	161	265	175	260	403	914	566	173	158	131	148	276
7	170	265	175	243	572	1,110	483	173	189	123	158	259
8	188	284	163	260	1,165	1,412	425	173	217	63	169	232
9	154	304	163	289	1,112	1,283	413	298	184	146	177	227
10	142	479	151	343	1,128	1,073	413	257	189	137	169	217
11	142	450	158	389	966	1,128	413	319	169	130	169	207
12	142	399	151	365	1,093	1,091	394	247	166	123	217	207
13	178	352	151	343	1,412	1,128	559	203	158	123	593	207
14	325	375	151	309	1,760	1,037	532	189	151	117	546	207
15	409	375	151	289	2,125	772	413	203	148	117	377	207
16	584	413	151	289	1,283	623	413	339	139	123	301	207
17	304	430	144	289	914	736	375	299	132	209	283	207
18	255	450	151	297	800	984	330	339	132	242	454	237
19	238	399	144	289	879	1,091	330	319	132	227	881	247
20	238	352	144	260	1,283	1,309	330	269	131	189	655	212
21	222	318	133	260	1,521	1,320	297	257	131	177	728	198
22	214	297	133	271	1,165	852	297	212	123	166	655	185
23	199	288	133	278	879	806	297	198	125	166	724	185
24	207	257	144	278	784	931	278	184	117	166	655	194
25	304	240	144	278	966	949	330	198	117	177	569	185
26	314	233	163	278	[illegible]	1,093	289	189	117	203	454	174
27	274	224	196	260	1,309	883	260	177	117	189	567	174
28	264	201	224	260	966	639	237	166	117	169	325	198
29	325	188	233	289	781	483	227	158	117	169	306	189
30	789		218	365	696	442	213	158	117	166	288	212
31	576		209		609		213	177		158		227

MONTHLY DISCHARGE of Silver Hope Creek, one-half mile from mouth, for 1912.

(Drainage area, 80 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
January	789	142	257	3·2	3·7	15,800	
February	479	188	329	4·1	4·4	18,900	
March	233	133	167	2·1	2·4	10,270	
April	389	233	291	3·6	4·0	17,300	
May	2,12[illegible]	356	966	12·1	13·9	59,400	
June	1,412	442	914	11·4	12·7	54,400	
July	744	213	396	4·9	5·6	24,350	
August	339	158	219	2·7	3·1	13,500	
September	242	117	154	1·9	2·1	9,160	
October	269	117	159	2·0	2·3	9,780	
November	881	139	369	4·6	5·1	21,860	
December	375	174	227	2·8	3·2	13,960	
The year	2,125	117	371	4·6	62·5	268,780	80

SILVER PITT CREEK (415).

Silver Pitt creek rises in the hills between Coquitlam lake and Pitt lake, at an elevation of about 3,000 feet, and flows from the west into Pitt river, near Pitt lake, at an elevation of 10 feet. It is part of the Pitt-Fraser drainage. About 3 miles from its mouth the stream flows out through a canyon to a flat where it has numerous branches, and frequently changes its channels. In the last mile of its course it forms a slough in which the water rises and falls with the water in Pitt river, under the influence of the tides.

The watershed is in the coast district, with a mean annual precipitation of about 80 inches. The stream does not freeze over near its mouth, but near the head-waters the winter conditions are more severe.

Coquitlam has applied for water for municipal supply, and New Westminster wants to develop power on the creek. Neither has made any use of the water as yet.

A gauging station was established on Silver Pitt creek on August 9, 1912, and gauge readings are being taken about three times a week. The station is at the lower end of the canyon and measures the whole flow of the stream. The gauge is a 6-foot vertical staff nailed to the upstream side of a 16-inch hemlock tree on the left bank of the stream. The meter measurements are made by wading at a section 5 feet above the gauge. There is a deep pool in the canyon above the station, and there are rapids below. One meter measurement has been taken at a low stage of the stream, giving a discharge of 249 cubic feet per second. During the season of 1913 sufficient meter measurements will be made to locate the rating curve.

SPILLIMACHEEN RIVER (418).

Spillimacheen river is the largest tributary of Upper Columbia river, entering from the west about 40 miles south of Golden. It drains an area of 580 square miles of the Selkirk mountains, in which the precipitation is fully 50 inches, principally snowfall. The mountains vary in height from 6,000 to 9,000 feet above sea level.

The Spillimacheen flows mostly in a southeasterly direction, corroborating the theory that the Columbia once upon a time flowed southerly, connecting with Kootenay river via Canal Flat.

Spillimacheen river has three main forks. About 10 miles from the mouth it divides into the North and Middle fork, the latter being the larger. Fifteen miles farther up the Middle fork divides, the larger branch being called the South fork, having its source near the head-waters of Bugaboo river. About 3 or 4 miles above the mouth of the South fork, the Middle fork is joined by Copper creek from the south.

The North fork is about 45 miles long and runs almost parallel to, and only 4 miles from the Middle fork. It has its source at Grizzly Pass, near Bald mountain, in township 27-24-5. Its main tributaries are McMurdo creek from the south, in township 25-23-5, and Baird creek from the east in township 26-24-5.

The principal interest on Spillimacheen river is lumbering, the stream being used extensively for log-driving. There is also a little mining done on some small tributaries.

Spillimacheen river station is about 1 mile from its mouth, and 3 miles from Spillimacheen Landing. The gauge is located on the highway bridge leading from the Landing to the Giant mine. The gauge is a vertical staff, 6 feet long, graduated in feet and tenths. Bench-marks were established and referred to the zero of the gauge. The gauge is fastened to a pier of the bridge near the right bank. At the station the river is about 124 feet wide and nearly 6 feet deep at mean water level. The difference between high and low water level is about 3 feet. The mean velocity at high water is over 3 feet per second.

Below the bridge, the river flows through a flat covered with thick undergrowth and timber, and is affected by back water from the Columbia at high water. Just above the bridge the river runs through a canyon 1 mile long. The fall in the canyon is 185 feet (measured by aneroid). The banks are steep and of a broken rock formation, being 45 feet high at the foot of the canyon and 80 feet high at the head. At the foot of the canyon the river is 75 feet wide, and 40 feet wide at the head. A pipe-line power development is feasible; the pipe-line would be less than a mile long by making a short rock cut. By constructing a dam 50 feet high and from 40 to 60 feet long at the head of the canyon, a head of 230 feet could be obtained. There would be only small pondage. A good power-house site is available at the foot of the canyon. There are no good natural lakes or storage reservoirs. Severe winter conditions would have to be met. There is no market at present for this power.

The flood flow of Spillimacheen river is of importance and interest in connection with the possible reclamation of the overflow bottom lands of the Upper Columbia valley from Golden to lake Windermere.

DISCHARGE MEASUREMENTS of Spillimacheen River, near Spillimacheen Landing, 1912.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 31	H. C. Hughes	1055	119	465	2·4	1·31	1,120
June 17	"	1055	122	585	4·7	2·20	2,740
June 19	"	1055	124	620	5·5	2·55	3,450
July 6	"	1055	122	570	4·8	2·25	2,750
July 17	"	1055	124	600	5·1	2·35	3,040
Sept. 29	"	1055	114	380	1·4	0·42	550

Gauge Height and Daily Discharge of Spillimacheen River, near Spillimacheen Landing, for 1912.

Day.	June.		July.		August.		September.		October.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		1,030	2·1	2,490		3,000	1·2	1,000	0·40	514
2		970		2,800	2·3	2,910		910		550
3	1·1	910	2·1	2,490		2,910	1·0	835		550
4		870		2,300	2·3	2,910		800	0·35	530
5	1·0	835	2·2	2,700		2,600		800		510
6		1,000		2,500	1·9	2,080	0·9	770	0·30	514
7	1·5	1,380		2,400	2·0	2,080		800		520
8	2·0	2,280	2·0	2,280		2,500	1·0	835	0·35	530
9		3,000		2,400	2·3	2,910		780		520
10		2,500	2·1	2,490		2,600	0·85	740		520
11		3,000	2·1	2,490	2·0	2,280		800	0·30	514
12		2,800		2,600		2,180		900		514
13		2,900	2·6	3,570	1·9	2,080	1·25	1,050	0·30	511
14		2,700	2·4	3,130		2,100		850		514
15		2,400	2·0	2,280		2,300	0·9	770	0·30	514
16		2,200		2,350	2·1	2,490		740		580
17	2·2	2,700		2,400		2,000	0·8	715		600
18		3,400	2·1	2,490	1·6	1,540		680	0·50	580
19	2·6	3,570		2,600		1,600		640		510
20	2·1	2,490	2·2	2,700		1,660	0·6	620	0·40	514
21	2·8	4,020	2·3	2,910	1·7	1,710		640		530
22	3·0	4,480		2,800		2,400	0·7	664	0·30	514
23		4,600	2·2	2,700	2·3	2,910		640		514
24	3·2	4,950		2,600		3,130	0·6	620		514
25		5,050		2,600	2·5	3,350		600	0·30	514
26	3·3	5,190	2·1	2,[illegible]90		3,460		600		500
27	3·0	4,480	2·0	2,280	2·6	3,570	0·5	580	0·20	488
28	2·8	4,020	2·0	2,280		2,200		565		475
29	2·3	2,910		2,600	1·3	1,110	0·42	550	0·10	465
30		2,800	2·3	2,910	1·3	1,110		550		465
31		..		3,000		1,050			0·10	465

MONTHLY DISCHARGE of Spillimacheen River, near Spillimacheen Landing, 1912.
(Drainage area, 580 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
June	5,190	835	2,850	4·9	5·5	169,600	
July	3,570	2,280	2,600	4·5	5·2	159,900	
August	3,570	1,050	2,350	4·0	4·6	144,500	
September	1,050	550	735	1·3	1·45	43,700	
October	600	465	521	0·9	1·04	32,000	
The period							50

NOTE. Gauging station established June 1, 1912. Freeze-up occurred November 1, 1912, and the station was abandoned for the season. The maximum discharge for 1912 occurred on June 26, and was 5,190 c.f.s. The maximum of an average year would be about 7,000 c.f.s. In 1894, the year of the famous flood, it probably attained 10,000 c.f.s. The river is frozen generally from the first week in November till about April 1. The minimum flow occurs about the latter part of February or early in March, and is estimated at 150 to 200 c.f.s. The gauge on Spillimacheen river was read only three times per week. In order to interpolate for the intervening days, a hydrograph of Bugaboo river was used as reference. These two rivers are adjacent and have very similar drainage areas.

SPIUS CREEK (212).

Spius creek has its source in mountains near township 11-23-6, at an elevation of 4,000 feet and, flowing due north for 25 miles, discharges into Nicola river near the Railway Belt boundary, at an elevation of 1,800 feet. It is part of the Nicola-Thompson drainage; the drainage area, as measured from a Dominion sectional map, scale 3 miles to an inch, is 344 square miles. The stream is used for both lumbering and irrigation. It is a stream varying from 25 to 100 feet in width, from 2 to 10 feet in depth, and has a mean velocity of from 1·5 to 5 feet per second. There is a very large freshet in May. The bed of the stream is generally rocky, and at times it passes through canyons and over small falls. The valley of the creek varies from one-quarter of a mile to one mile in width, and contains good agricultural land, for which irrigation is necessary, the precipitation not exceeding 20 inches, except very near the source. Considerable area of land is also taken up along Prospect creek, a large tributary entering from the west about 10 miles from the mouth. Several timber limits are held along Spius creek about 5 miles from the mouth, by the Nicola Valley Pine Lumber Co. This company established a mill 1 mile up the creek, and constructed a timber, rock-filled dam 40 feet high, which affords them a log pond of 25 acres. Logs are driven down the creek during the freshet in May and June.

The station on Spius creek was established August 15, 1911, by C. E. Richardson. The measuring section at low water is located 20 yards below the dam, and at high water one-half mile below the dam. A vertical staff gauge, 10 feet long, is located on the left bank of the stream, 200 yards below the dam. This station has been abandoned on account of the control of the Nicola Valley Pine Lumber Co.'s dam above the gauge and a new diversion dam just below the gauge. A new station will be established above the company's dam.

DISCHARGE MEASUREMENTS of Spius Creek, below dam, 1911-12.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
1911.							
Aug. 15	C. E. Richardson	1048	38	52·	3·5	0·87	130
Sept. 18	"	1048	56	60	2·6	0·92	156
1912.							
June 22	Cline & Corbould	1046	62	193	2·5	2·90	480
July 6	B. Corbould	1044	98	134	1·6	2·30	217
July 24	"	1044	27	36·5	2·6	1·75	96
Aug. 14	"	1044	28	28·	2·0	1·50	57

NOTE.— 1911, gauge No. 1; 1912, gauge No. 2.

DAILY GAUGE HEIGHT AND DISCHARGE of Spius Creek, below dam, for 1911.

Day.	August.		September.		October.		November.	
	Gauge height.	Discharge	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·7	75	0·8	105	0·7	75
2			0·7	75	0·8	105	0·7	75
3			0·7	75	0·8	105	0·7	75
4			0·7	75	0·8	105	0·7	75
5			0·7	75	0·8	105	0·7	75
6			0·8	105	0·8	105	0·7	75
7			0·8	105	0·8	105	0·7	75
8			0·7	75	0·8	105	0·7	75
9			0·7	75	0·8	105	0·7	75
10			0·7	75	0·8	105	0·7	75
11			0·7	75	0·8	105	0·7	75
12			0·7	75	0·8	105	0·7	75
13			0·8	105	0·8	105	0·7	75
14			1·1	250	0·8	105	0·7	75
15			1·07	235	0·8	105	0·7	75
16			1·05	225	0·8	105	0·7	75
17			1·0	200	0·8	105	0·8	105
18	0·8	105	0·95	175	0·8	105	0·8	105
19	0·8	105	0·9	150	0·8	105	0·8	105
20	0·8	105	0·9	150	0·8	105	0·8	105
21	0·8	105	0·9	150	0·75	90	0·8	105
22	0·8	105	0·9	150	0·75	90	0·8	105
23	0·8	105	0·9	150	0·75	90		
24	0·8	105	0·9	150	0·72	81		
25	0·8	105	0·87	136	0·7	75		
26	0·8	105	0·85	128	0·7	75		
27	0·8	105	0·82	114	0·7	75		
28	0·7	75	0·8	105	0·7	75		
29	0·7	75	0·8	105		75		
30	0·7	75	0·8	105	0·7	75		
31	0·7	75			0·7	75		

Lumber Company's Dam on Spius Creek.

Lumber Company's Dam on Spius Creek.

Monthly Discharge of Spius Creek, below dam, for 1911.

(Drainage area, 270 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
September	250	75	125	·46	·51	7,440	
October	105	75	96	·36	·42	5,900	
November	105	75	83	·31	·35	4,940	
The period	...	...	...	...	...	...	15

Note.—Station was established August 18, 1911.
Accuracy, "C."

Gauge Heights and Daily Discharge of Spius Creek, below dam, for 1912.

Day	May.		June.		July.		August.		September.	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	...	...	2·9	480	...	250	1·5	60	...	60
2	...	...	...	455	...	250	1·5	60	1·5	60
3		...	2·8	430	...	250	1·5	60	1·5	60
4	...	...	2·8	430	2·4	250	...	60	1·5	60
5		...	3·1	590	2·4	250	1·5	60	1·5	60
6	...	...	3·0	535	2·4	250	1·5	60	1·5	60
7		...	3·0	535	2·3	215	...	60	...	60
8	3·5	820	3·3	700	2·0	130	...	60	...	60
9	4·0	1,130		620	2·0	130	1·5	60	1·5	60
10	3·6	880	3·0	535	2·1	155	1·5	60	1·6	70
11	3·5	820	3·0	535	2·1	155		60	1 6	70
12	3·8	1,000	3·1	590	2·1	155	1·5	60	1·6	70
13	4 2	1,270	3 0	535	2·1	155	1·5	60	...	
14	4·5	1,480	2·8	430		170	1·5	60	...	
15	4·2	1,270	2·6	335	2·2	185	1·5	60	...	
16	3·8	1,000		360	2·1	155	1 8	95	...	
17	3·4	760	2·7	380	2·1	155	2·0	130	...	
18	3·2	645	2·6	335	2·0	130	2·0	130	...	
19	3·2	645		360	...	110	1·8	95	...	
20	...	700	...	385	...	90	1·7	80	...	
21	...	760		410		70	1·6	70	...	
22	3·5	820	2·8	430	1·4	50	1·5	60	...	
23	3·3	700		360	1·5	60	1·5	60	...	
24	...	715	2·5	290	1·7	80	1·5	60	...	
25	...	730	2·7	380	1·8	95	...	60	...	
26	...	745	2·7	380	1·8	95	1·5	60	...	
27	3·4	760	2·6	335	1·55	65	1·5	60		
28	3·0	535	2·4	250		80	1·5	60		
29	3·0	535		250	1·8	95	1·5	60	...	
30	3·0	535		250	1·5	60	1·5	60	...	
31	3·0	535	...		1·5	60	1·5	60	...	

MONTHLY DISCHARGE of Spius Creek, below dam, for 1912.

(Drainage area, 270 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
May	1,480	535	825	3·1	3·6	50,700	
June...	700	250	430	1·6	1·2	25,600	
July	250	50	142	·53	·61	8,730	
August	130	60	67·7	·25	·29	4,160	
The period							15

STEIN CREEK (131).

Stein creek has its source in the mountains surrounding mount Stein, at an elevation of 5,000 feet and, flowing in an easterly direction for a distance of 30 miles, discharges into Fraser river near Lytton, at an elevation of 500 feet. It is part of the Fraser drainage; the drainage area, as measured from a Dominion sectional map, scale 3 miles to an inch, is 130 square miles. The precipitation at the mouth is small (not exceeding 20 inches) but at the source on the eastern mountains of the coast range the precipitation (both rain and snow) is heavy, from 50 to 70 inches. The maximum discharge in 1912 amounted to 3,004 second-feet on June 30; the minimum flow was 80 second-feet on the 10th of March.

The stream generally is about 50 feet wide, from 2 feet to 10 feet deep, and varying in velocity from 1½ feet per second to 8 feet per second. The valley is rough and broken, covered with underbrush and scattered timber. The stream is fast and turbulent, rushing in and out of canyons, and over rapids and falls. The drop in the last 20 miles of the river is at the rate of 150 feet per mile. No agricultural land is to be found in the valley, at least not within 20 miles of the mouth. Above this 20-mile post the formation somewhat changes. It is claimed that for 2 or 3 miles the river is navigable for small craft. Through this district the hunting is excellent and the fishing unexcelled. Stein creek was prospected years ago, and a trail still runs practically to the source, but it presents great difficulties to travellers.

Stein creek is used at the present time for irrigation purposes. Records to the extent of 1,000 inches are taken out, appurtenant to lands in the vicinity along the valley of the Fraser.

The C.P.R. investigated Stein creek regarding water-power possibilities, but decided on nothing. The chief objection to any power development on Stein creek is the lack of good storage. Good summer power may be obtained.

The hydrographic station on Stein creek was established on September 22, 1911, by C. E. Richardson, and continuous readings have since been taken during the open season. The measuring section is located on the downstream side of the highway bridge, about half a mile from the mouth, and 3 miles from the Fraser river ferry above Lytton. All measurements are made by suspending the meter from a cable. A standard vertical staff gauge is fastened to the cribbing of the right abutment, on the downstream side. In the spring of 1912 a chain gauge was established for use during high water; the datum of both gauges is the same, and is referred to three bench-marks. This is a fair section, excellent control, high banks, and one permanent channel; but the channel bed is very rocky, and accurate soundings are difficult.

Discharge Measurements of Stein Creek, near mouth, 1911-12.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 22....	C. E. Richardson.....	1,048	57	203	3·4	0·60	684
1912.							
Mar. 27......	C. G. Cline...	1,046	38	121	1·3	*1·00	152
May 30....	"	1,046	55	279	4·9	1·75	1,360
July 26	"	1,046	50	250	4·8	1·70	1,190

*One foot below gauge datum.

Gauge Heights and Daily Discharge of Stein Creek, near mouth, for 1911.

Day.	September.		October.		November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1				440		255		245
2				425		255	−0·6	240
3				410	−0·54	255		240
4				395		230		240
5				385		210		240
6				375		190		240
7			−0·17	366		170		240
8				360		150		240
9				350		130		240
10				340	−1·33	101	−0·6	240
11				335		115		230
12				330		130		220
13				320		145		210
14			−0·34	313		160		200
15				310		170		190
16				307		180		180
17				304		190	−0·92	166
18				301		200		175
19				300		205		185
20				297		210		195
21			−0·4	295		220		205
22	0·6	685		290		230		215
23				285		235	−0·66	225
24				280		240		225
25				275		255		225
26				270	−0·5	265		225
27			−0·5	265		265		220
28				265		265		220
29	0·1	470		260		260		220
30				260		260		220
31				260				220

MONTHLY DISCHARGE of Stein Creek, near mouth, for 1911.

(Drainage area, 130 square miles.)

Month	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
October	440	260	322	2·5	2·9	19,800	
November	265	101	204	1·6	1·8	12,100	
December	245	166	219	1·7	2·0	13,500	

NOTE.—Station established Sept. 22, 1911.
Accuracy, "C."

Gauge Heights and Daily Discharge

Day.	January.		February.		March.		April.		May.	
	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		220		215	−1·4	92		200		650
2		220		215		90		210		660
3		220		215		88		220		670
4		220		215		86		230		680
5		220		215		86	−0·6	240	0·6	685
6		220		215		86		265		900
7		215		215		81		290		1,100
8		215		215		82		315		1,300
9		215		215		82		340		1,500
10		215	−0·7	215	−1·5	80		365		1,700
11		215		215		80	−0·[illegible]	390		1,900
12		215		215		80		420	3·0	2,100
13		215		215		90		450		2,020
14	0·7	215		215		90		480		1,950
15		215		215		100		520		1,880
16		215	−0·7	215		100		550		1,800
17		215		210		100		580		1,720
18		215		200		110		620		1,640
19		215		180		110		650	2·2	1,560
20		215		180		120	0·6	685		1,560
21		215		170		120	0·6	685		1,570
22		215		160		130		680		1,580
23		215	−0·1	150		130		670		1,590
24		215		140		130		660		1,600
25		215		130		140		650		1,610
26		215		120		140		640	2·3	1,620
27		215		110	−1·0	150		630		1,585
28		215		105		160	0·5	635		1,550
29		215		100		175		640		1,515
30		215			−0·8	190		645		1,480
31		215				200				1,445

of Stein Creek, near mouth, for 1912.

June.		July.		August.		September.		October.		November.		Day.
Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	
	1,405		2,860		1,330	0·5	635		440		335	1
	1,370		2,720		1,345		620		450		330	2
	1,335		2,580		1,360		610		460	0·3	325	3
	1,300		2,440	1·9	1,380		600		480		325	4
1·7	1,265		2,300		1,415		590		495		320	5
	1,490		2,160		1,450		580	0·2	510		315	6
	1,715		2,020		1,485		565		475		310	7
	1,940		1,880		1,520	0·3	550		450		305	8
3·1	2,180		1,740		1,555		575		425		300	9
	2,200		1,600		1,590		600		400	0·4	295	10
	2,225		1,460	2·3	1,620		625		375		310	11
	2,250	1·8	1,320		1,600		650		350		325	12
	2,275		1,360		1,580		675	0·3	325		340	13
	2,300		1,400		1,560		700		325		355	14
	2,320		1,440		1,540	0·7	730		330		360	15
3·3	2,340		1,480		1,520		700		325		375	16
	2,395		1,520		1,510		675		330	−0·1	390	17
	2,450		1,560	2·1	1,500		650		345		400	18
	2,500		1,600		1,490		625		350		415	19
	2,550		1,640		1,480		600	−0·2	355		430	20
	2,600	2·4	1,680		1,470		575		355		440	21
3·7	2,660		1,620		1,460	0·3	550		355		450	22
	2,700		1,560		1,450		530		355		460	23
	2,750		1,500		1,445		510		355	0·4	470	24
	2,800		1,440	2·0	1,440		490		355		470	25
	2,840		1,380		1,300		470		355		470	26
	2,880		1,320		1,170		450	−0·2	355		470	27
	2,920	1·7	1,265		1,040		440		355		470	28
	2,960		1,280		910	0·0	430		350		470	29
4·0	3,300		1,295		780		430		345		470	30
			1,315		700				340			31

MONTHLY DISCHARGE of Stein Creek, near mouth, for 1912.

(Drainage area, 130 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area	Total in acre-feet.	Inches.
January	220	215	216	1·7	2·0	13,300	
February	215	100	186	1·4	1·5	10,700	
March	200	80	113	0·9	1·0	6,900	
April	685	200	485	3·7	4·1	28,900	
May	2,100	650	1,455	11·2	12·9	89,400	
June	3,000	1,405	2,264	17·4	19·4	135,000	
July	2,860	1,265	1,701	13·1	15·1	105,000	
August	1,520	700	1,387	10·7	12·3	85,200	
September	730	430	581	4·5	5·0	34,600	
October	510	325	383	2·9	3·3	23,600	
November	470	295	383	2·9	3·2	22,800	

NOTE.—During January and February stream partly frozen over.
Accuracy, "C."

SULLIVAN CREEK (242).

Sullivan creek has its source in Knouff lakes, at a probable elevation of 3,000 feet, and discharges into North Thompson river from the east, 20 miles north of Kamloops. It is part of the North Thompson drainage; the drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 17 square miles. Sullivan creek is a small irrigation stream; its upper reaches are on the easterly edge of the Dry Belt, where the annual precipitation may sometimes reach 25 inches. At the mouth, in the most arid portion of the Dry Belt, the mean annual precipitation is about 10 inches.

Sullivan creek is about 8 miles long, 4 feet wide, and varies from a few inches to one foot in depth. Knouff lakes, the source of the creek, afford good storage for [illegible] tion water. For the first 3 miles the creek descends at the rate of 300 f[illegible] mile, when it reaches the Sullivan valley at an elevation of about 2,000 fe[illegible] good farms are located in the valley, which is 12 square miles in area [illegible] settled, and affords excellent range land. From this point to the mout[illegible] falls rapidly; there is much loss from seepage, the creek often being d[illegible] while running in the Sullivan valley. The prior record is appurtena[illegible] North Thompson valley, but, to utilize the water, fluming or pipin[illegible] sary. Water is diverted from Edwards creek, which rises in the vici[illegible] lakes, and is applied to land in the Sullivan valley.

The station on Sullivan creek was established August 21, 191[illegible] The measuring section is located about 30 feet below the Sullivan divers[illegible] the Sullivan valley road, at Edwards' ranch. It is a good section; the control is [illegible] current uniform, banks not liable to overflow, and one permanent channel. [illegible] measurements are made by wading; they might be affected by the rising and [illegible] of the stream, which occurs frequently. A standard vertical staff gauge is located on the right bank 7 feet above Cameron's private bridge. The datum of the gauge is referred to three bench-marks.

DISCHARGE MEASUREMENTS of Sullivan Creek, above diversions, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft
Aug. 21	C. G. Cline	1046	3·5	1·7	0·3	1·51	0·4
1912.							
May 2	Cline and Dann	1046	8·0	6·3	0·8	2·10	5·3
May 31	E. M. Dann		4·0	2·0	1·6	1·93	3·2*
Aug. 19	H. J. Keyes	1057	7·7	4·2	0·7	1·90	3·0

*Float measurement.

DAILY GAUGE HEIGHT AND DISCHARGE of Sullivan Creek, above diversions, for 1911.

Day	August.		September		October.		November.	
	Gauge height.	Discharge.	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge.
1			1.5	0.4	1.45	0.3	1.5	0.4
2			1.5	0.4	1.45	0.3	1.5	0.4
3			1.5	0.4	1.45	0.3	1.5	0.4
4			1.5	0.4	1.45	0.3	1.5	0.4
5			1.5	0.4	1.45	0.3		
6			1.5	0.4	1.45	0.3		
7			1.5	0.4	1.45	0.3		
8			1.5	0.4	1.45	0.3		
9			1.5	0.4	1.45	0.3		
10			1.45	0.3	1.45	0.3		
11			1.45	0.3	1.45	0.3		
12			1.45	0.3	1.45	0.3		
13			1.5	0.4	1.45	0.3		
14			1.5	0.4	1.45	0.3		
15			1.5	0.4	1.45	0.3		
16			1.5	0.4	1.5	0.4		
17			1.5	0.4	1.5	0.4		
18			1.5	0.4	1.5	0.4		
19			1.5	0.4	1.5	0.4		
20			1.5	0.4	1.5	0.4		
21	1.5	0.4	1.5	0.4	1.5	0.4		
22	1.5	0.4	1.45	0.3	1.5	0.4		
23	1.5	0.4	1.45	0.3	1.5	0.4		
24	1.5	0.4	1.45	0.3	1.5	0.4		
25	1.5	0.4	1.45	0.3	1.5	0.4		
26	1.5	0.4	1.45	0.3	1.5	0.4		
27	1.5	0.4	1.45	0.3	1.5	0.4		
28	1.5	0.4	1.45	0.3	1.5	0.4		
29	1.5	0.4	1.45	0.3	1.5	0.4		
30	1.5	0.4	1.45	0.3	1.5	0.4		
31	1.5	0.4			1.5	0.4		

MONTHLY DISCHARGE of Sullivan Creek, above diversions, for 1911.

(Drainage area, 17 square miles.)

Month.	Discharge in Second Feet.			Run Off.			Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
September	0.4	0.3	0.36	.02	.02	21	
October	0.4	0.3	0.35	.02	.02	21	
The period							10

NOTE.—This station was established on August 21, 1911. There is a dam at the outlet of the lower Knouff lake which regulates to some extent the flow of Sullivan creek.
Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Sullivan Creek, above diversions, for 1912.

Day.	May.		June.		July.		August.		September	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1....	....	5·3	1·8	2·0	2·0	4·1	1·7	1·2	1·8	2·0
2....	2·1	5·3	1·8	2·0	2·0	4·1	1·65	1·0	1·85	2·5
3....	2·1	5·3	1·8	2·0	2·0	4·1	1·6	0·7	1·85	2·5
4....	2·1	5·3	1·8	2·0	2·0	4·1	1·6	0·7	1·8	2·0
5....	2·1	5·3	1·8	2·0	2·0	4·1	1·7	1·2	1·8	2·0
6....	2·1	5·3	1·8	2·0	2·0	4·1	1·9	2·9	1·8	2·0
7....	2·1	5·3	1·8	2·0	2·0	4·1	1·9	2·9	1·9	2·9
8....	2·1	5·3	1·8	2·0	2·0	4·1	1·9	2·9	1·85	3·0
9....	2·1	5·3	1·8	2·0	1·9	2·9	1·9	2·9	1·8	2·0
10....	2·1	5·3	2·1	5·3	1·9	2·9	1·9	2·9	1·8	2·0
11....	2·1	5·3	2·2	6·5	1·9	2·9	1·9	2·9	1·8	2·0
12....	2·2	6·5	2·3	7·8	1·9	2·9	1·9	2·9	1·8	2·0
13....	2·1	5·3	2·2	6·5	1·9	2·9	1·9	2·9	1·7	1·2
14....	2·1	5·3	2·3	7·8	1·9	2·9	1·9	2·9	1·7	1·2
15....	2·1	5·3	2·3	7·8	1·8	2·0	1·9	2·9	1·7	1·2
16....	2·1	5·3	2·3	7·8	1·8	2·0	1·9	2·9		
17....	2·1	5·3	2·3	7·8	1·8	2·0	1·9	2·9		
18....	2·1	5·3	2·3	7·8	1·8	2·0	1·9	2·9		
19....	2·1	5·3	2·2	6·5	1·8	2·0	1·9	2·9		
20....	2·1	5·3	2·2	6·5	1·8	2·0	1·9	2·9		
21....	2·0	4·1	2·2	6·5	1·8	2·0	1·9	2·9		
22....	2·0	4·1	2·2	6·5	2·0	4·1	1·8	2·0		
23....	2·0	4·1	2·1	5·3	2·0	4·1	1·8	2·0		
24....	2·0	4·1	2·1	5·3	1·8	2·0	1·8	2·0		
25....	2·0	4·1	2·0	4·1	1·75	1·6	1·8	2·0		
26....	2·0	4·1	2·0	4·1	1·7	1·2	1·8	2·0		
27....	2·0	4·1	2·1	5·3	1·7	1·2	1·8	2·0		
28....	2·0	4·1	2·1	5·3	1·7	1·2	1·8	2·0		
29....	1·9	2·9	2·1	5·3	1·7	1·2	1·8	2·0		
30....	1·9	2·9	2·0	4·1	1·7	1·2	1·8	2·0		
31....	1·9	2·9	....	....	1·7	1·2	1·8	2·0		

MONTHLY DISCHARGE of Sullivan Creek, above diversions, for 1912.
(Drainage area, 17 square miles.)

Month.	Discharge in Second-Feet.				Run Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May....	6·5	2·9	4·8	·30	·35	295	
June....	7·8	2·0	4·9	·29	·32	292	
July....	4·1	1·2	2·7	·16	·18	166	
August....	2·9	0·7	2·3	·13	·15	141	
September....	3·0	1·2	(estimated) 1·7	·10	·11	101	
The period....							10

NOTE.—The flow of Sullivan creek is regulated to some extent by a dam on lower Kneuff lake. Accuracy, "A."

SWELTZER CREEK (111).

Sweltzer creek rises in Cultus lake, at an elevation of 200 feet, and discharg[es] into Chilliwack river at an elevation of 100 feet. It is part of the Chilliwack-Fras[er] drainage. Its watershed area is 35 square miles. The Indians use a little of the wat[er] for domestic purposes on the reserve and there is no immediate prospect of any oth[er] use of it. There is good fishing in Sweltzer creek and in Cultus lake. The stream [is] in the Coast district, with a mean annual precipitation of from 60 to 70 inches. The is a considerable snowfall during the winter on the higher parts of the watershed. The stream does not freeze over near the mouth. The country is rough, and there are mountains in the vicinity. There is some timber on the hills. Surveys have recently been made around Cultus lake, and there is some land open for settlement.

The gauging station on Sweltzer creek is about a quarter of a mile from the mouth of the creek. It is three-quarters of a mile from the Vedder River hotel, which is 6 miles north of Sardis, a station near Chilliwack on the electric railway from New Westminster. The gauge is a 5-foot staff nailed to a large alder tree about 50 feet above the ford on the Cultus lake road, on the left bank of the stream, among the trees, and is referred to three bench marks. Meter measurements are made by wading at a section 30 feet below the gauge.

Regular gauge readings were taken three times a week continuously from November 14, 1911, to November 14, 1912. They were discontinued because it was considered that one year's measurement would be sufficient on this unimportant stream.

DISCHARGE MEASUREMENTS of Sweltzer Creek, near mouth, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.
1911			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Nov. 14	E. H. Smith	1057	50	33	2.2	1.25	75
Dec. 8		1057	55	62	2.6	1.60	162
1912							
Jan. 22	E. E. Cline	1016	18	41	1.9	1.38	79
July 6		2036	50	32	1.7	1.30	55
Sept. 4		1016	50	31	1.4	1.20	43

GAUGE HEIGHTS AND DAILY DISCHARGE of Sweltzer Creek, near mouth, for 1911.

Day.	November Gauge height.	November Discharge.	December Gauge height.	December Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			1.7	216
2				216
3			1.7	216
4				230
5			1.75	245
6				218
7				190
8			1.6	162
9				175
10			1.65	189
11				175
12			1.6	162
13				162
14	1.25	50	1.6	162
15		50	1.55	139
16	1.25	50		128
17		106	1.5	116
18	1.6	162		116
19		218	1.5	116
20	1.8	274		116
21		260	1.5	116
22	1.75	245		128
23		230	1.55	139
24	1.70	216		139
25		230	1.55	139
26	1.75	245	1.5	116
27		230		116
28	1.7	216		116
29		216	1.5	116
30		216		107
31			1.45	98

GAUGE HEIGHTS AND DAILY DISCHARGE

Day.	January.		February.		March.		April.		May.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	height	Sec.-ft.	Feet.	Sec.-ft.
1		98	1·7	216		116	1·4	81	1·3	58
2	1·45	98		216	1·5	116		81		58
3		98	1·7	216		116	1·4	81	1·3	58
4	1·45	98		189	1·5	116		81		58
5		98	1·6	162		116	1·4	81	1·3	58
6	1·45	98		162	1·5	116		81		70
7		90	1·6	162		116	1·4	81	1·4	81
8	1·4	81		189	1·5	116		81		81
9		81	1·7	216		98	1·4	81	1·4	81
10	1·4	81		189	1·4	81		81		81
11		81	1·6	162		81	1·4	81	1·4	81
12	1·4	81		162	1·4	81		81		81
13		90	1·6	162		81	1·4	81	1·4	81
14	1·45	98		189	1·4	81		81		81
15	1·45	98	1·7	216		81	1·4	81	1·4	81
16		104		216	1·4	81		81		81
17		110	1·7	216		81	1·4	81	1·4	81
18	1·5	116		189	1·4	81		81		81
19		116	1·6	162		81	1·4	81	1·4	81
20	1·5	116		162	1·4	81		81		81
21		116	1·6	162		81	1·4	81	1·4	81
22	1·5	116		162	1·4	81		81		81
23		139	1·6	162		81	1·4	81	1·4	81
24	1·6	162		162	1·4	81		81		81
25		162	1·6	162		81	1·4	81	1·4	81
26	1·6	162		139	1·4	8		81		98
27		162	1·5	1[illegible]		81	1·4	81	1·5	116
28	1·6	162		[illegible]6	1·4	81		81		116
29		189	1·5	[illegible]6		81	1·4	81	1·5	116
30	1·7	216			1·4	81		70		116
31		216				81			1·5	116

of Sweltzer Creek, near mouth, for 1912.

June.		July.		August.		September.		October.		November.		Day.
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet.	Sec.-ft	Feet.	Sec.-ft.	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	Feet.	Sec.-ft	
	116	1·	81	1·2	43		43		43	1·3	58	1
1·5	116	1·4	81		43	1·2	43	1·2	43		58	2
	98		70	1·2	43		43		43	1·3	58	3
1·4	81	1·3	58		43	1·2	43	1·2	43		58	4
	81		58	1·2	43		43		43	1·3	58	5
1·4	81	1·3	58		43	1·2	43	1·2	43		58	6
	81		58	1·2	43		43		43	1·3	58	7
1·4	81	1·3	58		43	1·2	43	1·2	43		58	8
	81		58	1·2	43		43		43	1·3	58	9
1·4	81	1·3	58		43	1·2	43	1·2	43		58	10
	81		58	1·2	43		43		43	1·3	58	11
1·4	81	1·3	58		43	1·2	43	1·2	43			12
	81		58	1·2	43		43		43			13
1·4	81	1·3	58		50	1·2	43	1·2	43			14
	81		58	1·3	58		43		43			15
1·4	81	1·3	58		58	1·2	43	1·2	43			16
	81		58	1·3	58		43		43			17
1·4	81	1·3	58		58	1·2	43	1·2	43			18
	98		58	1·3	58		43		41			19
1·5	116	1·3	58		58	1·2	43	1·2	43			20
	98		58	1·3	58		41		43			21
1·4	81	1·3	58		58	1·2	43	1·2	43			22
	81		58	1·3	58		43		43			23
1·4	81	1·3	58		50	1·2	43	1·2	43			24
	81		58	1·2	43		43		50			25
1·4	81	1·3	58		43	1·2	43	1·3	58			26
	81		50	1·2	43		43		58			27
1·4	81	1·2	43		43	1·2	43	1·3	58			28
	81		43	1·2	43		43		58			29
1·4	81	1·2	43		43	1·2	43	1·3	58			30
			43	1·2	43				58			31

MONTHLY DISCHARGE of Sweltzer Creek, near mouth, for 1912.

(Drainage Area, 30 square miles.)

Month.	Discharge in Second-Feet				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
January	216	81	120	4·0	4·6	7,380	
February	216	116	174	5·8	6·2	10,000	
March	116	81	91	3·0	3·5	5,600	
April	81	70	81	2·7	3·0	4,820	
May	116	58	83	2·8	3·2	5,100	
June	116	81	86	2·9	3·2	5,120	
July	81	43	58	1·9	2·2	3,570	
August	58	43	48	1·6	1·8	2,950	
September	43	43	43	1·4	1·6	2,560	
October	58	43	46	1·5	1·7	2,830	
The period						50	

Accuracy, "B."

Thompson River (201-204).

Thompson river is the third largest river in British Columbia, being only exceeded by Fraser and Columbia rivers. It discharges into Fraser river at Lytton, 150 miles from the coast. The drainage area of the Thompson is 21,800 square miles, and may be divided into three divisions: The North Thompson drainage of 7,400 square miles, the South Thompson drainage of 7,000 square miles and the drainage of Thompson river from Kamloops to Lytton, of 7,400 square miles.

(1) The North Thompson rises at an elevation of 4,000 to 6,000 feet, about 10 miles south of Tete-Jaune Cache. It might be noted here that within a radius of 5 miles may be found the source of the Fraser, the Canoe (a tributary of Columbia river) and the North Thompson, the three streams which drain practically the whole of the south half of British Columbia. From its source the North Thompson flows south to Kamloops, where it joins South Thompson river. The valley of the North Thompson is being opened up by the Canadian Northern Pacific railway, which follows the river from Tete Jaune Cache to Kamloops.

The mineral wealth of the country in this drainage is still unknown. Mica exists in large quantities in the upper valley, above Mad river. Gold has been found in various tributaries and, at the present time, a mine is being worked on Louis creek, about 30 miles north of Kamloops, which, if it turns out well, will be a big asset to the surrounding country. Water-power may be developed on the river itself at Hell-Gate, 160 miles up. A head of 30 feet may be obtained, and a minimum flow of 300 to 500 second-feet. Of the tributaries, Barrier river, at the 35-mile post, is the most important. A plant is now being installed whereby the city of Kamloops will obtain its light and power from the Barrier. Good industrial powers of from 1,000 to 2,000 horse-power may be located on the following streams: (1) Mad river, at the 97-mile post. (2) Tum Tum creek, at the 112-mile post. (3) Salmon or Porcupine creek, at the 136-mile post. (4) Hell Roaring creek, at the 152-mile post. (5) Pyramid creek, at the 162 mile post. All these streams become very small in the winter and very little continuous power could be obtained.

From Tete Jaune Cache to Kamloops, by the river, is about 250 miles, but by the C.N.R. it is less than 190. (All mile posts are located by the C.N.R.) From Kamloops to Mad river, at the 97-mile post, the valley varies from one-half mile to 1 mile in width, the soil is a sandy loam and first class land for fruit and mixed farming. Above Mad river the valley becomes much narrower, and there are only about 16,000 acres of arable land. Irrigation is required up to the 100 mile post, the precipitation varying from 7 inches to 13 inches at Kamloops, to 10 inches at the Albreda summ Practically all the land has been taken up in the valley, the few unsettled bits, here and there, being very poor land.

There is no large timber in the valley except near the source, where several limits are held.

The streams and rivers above the 97 mile post are devoid of fish, said to be due to the large amount of mica in the water; and apart from a few bear there is no game to speak of in the valley.

The station on the North Thompson (203) was established by C. G. Cline February 13, 1912, at Cooney's ranch, 2 miles above the Heffely riffle, and 18 miles north of the city of Kamloops. It is a quarter of a mile above the mouth of Jamieson creek. The gauge is a chain gauge whose total length is 35 feet, suspended from pulley on the end of a small tree trunk nailed to two trees, and projecting over the stream. Measurements are made from a row boat steadied by a cable, which is stretched across the stream for each metering, owing to the stream being navigable it is not practicable to leave the cable permanently in place. The banks are from to 50 feet high and the river is in one channel, whose depth is about 20 feet in water, and whose width is about 100 feet. The range of gauge heights from low to high water is from 10 to 15 feet.

The bench-marks to which the chain gauge is referred, are as follows:

B.M. No. 1.—Nail in top of 8-inch poplar stump, 24 feet north of the gauge and 12 feet from the edge of the river at low water. Its elevation is 29·67 feet.

B.M. No. 2.—Nail in top of 6-inch poplar stump, 20 feet north of the gauge and 24 feet from the edge of the river at low water. Elevation 27·50 feet.

B.M. No. 3.—Nail in top of 8-inch poplar stump, 72 feet north of the gauge and 20 feet from low water line. Elevation, 27·35 feet.

The maximum discharge of the North Thompson in 1912 was about 40,000 second-feet in June, and the minimum flow was 1,600 second-feet, and occurred in March. Sufficient measurements have not been obtained to compute the daily discharges.

The North Thompson river is navigable during the summer from Kamloops to the 92-mile post, from the 112 to the 125-mile post and from the 137 to the 172 mile post.

(2) *South Thompson River.* The North and South Thompson meet at Kamloops (Chinook for 'Meeting of the waters'). The South Thompson rises in Shuswap lake, and is only a flowing stream between Chase and Kamloops, a distance of 40 miles. It is very sluggish, the fall between Shuswap lake and Kamloops being only 15 feet. The valley between Kamloops and Chase is from 1 mile to 3 miles wide, and is very suitable to mixed farming and fruit growing. The drainage area is 400 square miles, and a large percentage of this land may be cultivated or used for grazing land. The one great drawback is the lack of water for irrigation.

The remaining 6,600 square miles of the South Thompson watershed are drained by the Shuswap lakes. The chief feeders of this body of water are Adams river, Anstey river, Seymour river, Eagle river, Shuswap river, and Salmon river. The precipitation throughout the catchment basins of these streams averages about 30 inches, the Salmon being the only one in the Dry Belt. Adams river is an ideal power stream, and also drains a fertile and well-timbered country. The C.P.R. runs along Eagle river, and it was at its source (Clanwilliam) that the C.P.R. connected its transcontinental line some twenty odd years ago. Shuswap river has two good power sites on it, one below Sugar lake, the other below Mabel lake. Immense timber limits are held around Mabel and Sugar lakes. Shuswap river drains the famous Okanagan valley from Armstrong north. Salmon river drains the Grand Prairie district, so well known as a mixed farming and ranching country. For further information on these streams, see the individual gazetteers and reports.

South Thompson, rising as it does in a humid mountain district, has at its headwaters an annual precipitation of 30 inches to 40 inches. At its confluence with the North Thompson in the arid belt the annual precipitation is from 8 inches to 13 inches.

The South Thompson is navigable during high water, and every week during the summer steamers ply between Kamloops, Chase, Sicamous, Salmon Arm and Anstey Arm.

The gauging station on the South Thompson (201) was established by C. E. Richardson on October 20, 1911, below Little Shuswap lake near the town of Chase, but daily gauge readings taken by the Adams River Lumber Co. since April, 1911, have been secured. The measuring section is located immediately below the lake in the same section as the Adams River Lumber Company's Upper wharf. The wharf is [illegible] feet from the left bank, and this distance is spanned by a bridge. The river here is about 450 feet wide, and a cable is stretched across the remaining 300 feet when measurements are made. The gauge is a standard vertical staff gauge and is fastened to a pile in the measuring section. Measurements are made from the bridge between the left bank and the wharf and from a boat steadied by the cable for the remaining part of the distance. This cable cannot be left permanently in place on account of the navigation on the river. The right bank is high and sparsely timbered, the left bank is gently sloping and clean. The stream is in one channel, with a gravel and sand bottom, and there is no possibility of overflow. The depth varies from 15 feet to 25 feet.

Three bench-marks have been established and their elevations, referred to the datum of the gauge, are as given below:—

B.M. No. 1.—Nail head on the top of the pile to which the gauge is fastened. Elevation, 15·20 feet.

B.M. No. 2.—Nail head on the pile on the upstream side of the wharf, across from the gauge. Elevation, 15·59 feet.

B.M. No. 3.—Nail head on the pile on the upstream side of the wharf 30 feet from the gauge. Elevation, 15·95 feet.

The maximum flow since April, 1911, was 36,000 c.f.s., and took place on June 28, 1911. The minimum flow was 2,400 c.f.s., and took place on March 1, 1912.

(3) From Kamloops the river flows into Kamloops lake, a lake about 20 miles long and from 1 to 2 miles wide. As the river leaves the lake the fall becomes greater and, in the 20 miles to Ashcroft, there is a drop of 200 feet. After leaving Ashcroft the river flows through the Black canyon. Between Ashcroft and Spences Bridge the river is very swift, and in the 25 miles there is a fall of 225 feet. Between Spences Bridge and Lytton the river is in a canyon practically all the way (30 miles). The fall in this distance is 317 feet. In 1894 the Ashcroft bridge was carried away; in five hours the debris was at Lytton, showing an average velocity of over 10 miles an hour. At Lytton, Thompson river discharges into the Fraser. The C.P.R. follows the left bank of the river from Chase to Lytton. The C.N.R. comes down the North Thompson and then follows the right bank practically all the way to Lytton. This eliminates any power possibilities.

There are good bench lands along both sides of the Thompson between Kamloops and Spences Bridge, but lack of water is the great difficulty in cultivation all through this district. The precipitation is very small not exceeding 10 inches to 13 inches.

The three largest tributaries of Thompson river below Kamloops are the Deadman entering from the right; below Savona lake, the Bonaparte entering from the right at Ashcroft and the Nicola entering from the left at Spence's Bridge. All drain rich agricultural districts and ranching countries. Practically the whole drainage below Kamloops and above Spences Bridge consists of a rolling-hill country, unexcelled for ranching, and rich, agriculturally, where water can be obtained.

There is gold in the Thompson. Iron is prevalent in the Kamloops district, and three coal mines are working at Merritt in the Nicola valley.

The Thompson drains the most settled part of the interior of British Columbia with the exception of the lower Okanagan valley. The climate generally might be described as hot and dry in the summer, with a cold short winter, with little snow. The country is well supplied with game, and fishing is good in both the large and small streams and lakes.

There are two stations on the main Thompson, one at Kamloops just below the junction of its component branches, and one at Spences Bridge, about 30 miles from the mouth.

The station at Kamloops (202) was established by C. E. Richardson on September 8, 1911, and the measuring section is located on the upstream side of the lower traffic bridge, and three-quarters of a mile below the confluence of the north and south branches. The gauge is a standard vertical staff gauge, 18 feet long, and is divided into feet and quarter-feet. It is fastened to the inside of the cribbing that supports the swing bridge. The meter is suspended from a cable, and must be weighted with from 15 to 30 pounds of lead. The section is a uniform one, 800 feet wide, while the banks are high and clean. The elevation of the gauge datum referred to the C.P.R., at the middle of the cow protectors just south of the bridge, is 22·69 feet.

The river rises from the end of March to the middle of June from 12 to 17 feet, receding slowly till December, when it freezes over and remains fairly constant till March. Gauge readings were taken on the Kamloops gauge by the Meteorological Service during 1911, and by its courtesy they are published, together with the corresponding discharges according to the rating of the Hydrographic Survey.

The station at Spences Bridge (201) was established on October 25, 1911, by C. E. Richardson, and continuous readings have since been obtained. The measuring section is located on the downstream side of the highway bridge, and measurements are made by cable suspension. The gauge is located on the upstream side of the bridge, about 200 feet from the left bank. It is a chain gauge, 39·14 feet from tip to tip. Graduations are marked in feet and tenths, in black paint, along the handrail for 20 feet.

The banks of the stream slope gradually to the bridge abutments and consist of rocks and broken stone. The bed of the stream is gravel, and varies in depth from 7 feet to 20 feet. The stream is confined to one channel, broken only by the bridge piers. In ordinary stages there are only two parts to the channel, but at high water there are four.

The C.P.R. rail (altitude 776·0 feet above sea level) is 69·4 feet above the datum of the gauge. Thus, the elevation of the gauge datum is 706·6 feet above sea level.

Thompson river does not freeze over at Spences Bridge.

DISCHARGE MEASUREMENTS of Thompson River, at Kamloops, 1911-12.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 8	C. E. Richardson, W. M. Carlyle	1048	715	11,600	1·90	4·37	22,000
Oct. 3	C. E. Richardson	1048	706	10,100	1·36	2·50	13,700
Dec. 1	C. E. Richardson, K. H. Smith	1048	695	8,650	0·83	0·50	7,180
1912							
Mar. 5	C. E. Richardson	1047	685	8,030	0·50		3,980*
Apr. 2	C. E. Richardson, H. J. J. Keys	1057	690	8,037	0·51	0·20	4,090
May 9	C. E. Richardson	1048	767	14,300	3·33	8·50	47,700
July 22	" "	1048	768	13,100	2·74	7·07	35,900
Aug. 23	" "	1048	765	12,300	2·70	6·20	33,400

*Ice cover.

DAILY GAUGE HEIGHT AND DISCHARGE of Thompson River, at Kamloops, for 1911.

Day	April.		May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·08	12,120	9·83	58,470	12·8	84,100	7·92	43,540	5·27	26,650
2			3·00	15,800	11·0	68,500	12·9	85,000	7·92	43,540	5·44	27,600
3			3·31	17,140	11·7	74,500	13·3	88,600	7·50	40,600	5·58	28,380
4	0·36	5,980	3·86	19,640	12·0	77,100	12·6	82,300	7·33	39,410	5·10	25,700
5	0·58	6,640	4·19	21,160	11·7	74,500	12·4	80,500	7·06	37,520	4·78	24,000
6	0·75	7,200	4·75	23,850	11·2	70,200	12·2	78,700	7·00	37,100	5·00	25,200
7	1·10	8,400	5·36	27,160	10·7	65,900	12·1	77,900	6·73	35,210	4·83	24,250
8	1·19	8,070	5·81	29,660	10·4	63,400	12·0	77,100	6·73	35,210	4·44	22,300
9	1·27	8,980	5·69	28,950	10·2	61,700	12·1	77,900	6·58	34,180	4·78	24,000
10	1·00	8,100	5·50	27,900	10·3	62,500	11·8	75,300	6·48	33,600	4·06	20,600
11	1·00	8,100	5·50	27,900	10·4	63,400	11·5	72,700	6·17	31,820	3·94	20,000
12	1·23	8,820	5·75	29,300	11·2	70,200	11·1	69,300	6·00	30,800	3·81	19,440
13	1·42	9,580	5·80	29,660	11·8	75,300	10·8	66,800	5·75	29,300	3·75	19,150
14	1·67	10,480	6·00	30,800	13·0	85,900	10·4	63,400	5·63	28,650	3·89	19,760
15	1·55	10,050	6·17	31,820	13·9	94,100	10·2	61,700	5·73	29,180	4·42	22,200
16	1·44	9,660	6·44	33,400	11·5	99,600	10·2	61,700	5·92	30,320	4·39	22,050
17	1·33	9,220	7·25	38,850	14·8	102,400	10·3	62,500	5·50	27,900	4·44	22,300
18	1·47	9,780	8·25	45,950	14·8	102,400	10·1	63,400	5·36	27,160	4·48	22,500
19	1·50	9,900	8·92	51,060	14·6	100,500	10·4	63,400	5·17	26,120	4·00	20,300
20	1·67	10,480	9·00	51,700	14·3	97,800	10·0	60,000	5·19	26,240	3·73	19,050
21	1·67	10,480	9·00	51,700	13·4	89,500	9·73	57,610	5·59	28,440	3·50	18,000
22	1·75	10,800	8·75	49,800	12·8	84,100	9·44	55,320	5·52	28,020	3·73	19,070
23	1·83	11,120	8·83	50,410	12·4	80,500	9·23	53,570	5·45	27,650	3·64	18,600
24	2·00	11,800	8·50	47,900	12·3	79,600	9·23	53,570	5·23	26,450	3·50	18,000
25	2·17	12,410	8·42	47,260	12·2	78,700	9·08	52,340	5·00	25,200	3·23	16,750
26	2·50	13,700	8·33	46,540	12·2	78,700	9·23	53,570	5·02	25,300	3·00	15,800
27	2·75	14,700	8·25	45,950	12·1	77,900	9·39	51,920	4·83	24,250	2·94	15,500
28	2·83	15,020	8·23	45,810	12·7	83,200	9·08	52,340	4·92	24,720	2·94	15,500
29	2·67	14,380	8·25	45,950	12·8	84,100	8·19	45,520	4·56	22,900	2·73	14,620
30	2·83	15,020	8·39	47,020	12·9	85,000	8·36	46,780	4·33	21,750	2·60	14,100
31			8·92	51,060			8·10	14,800	4·60	23,100		

MONTHLY DISCHARGE of Thompson River, at Kamloops, for 1911.

(Drainage area, 14,100 square miles.)

Month	Discharge in Second Feet. Maximum	Minimum	Mean	Per sq. mile.	Run-Off. Depth in inches on Drainage area	Total in acre-feet.
April	15,020	5,980	10,300	0·72	0·8	612,900
May	51,700	12,120	36,200	2·51	2·9	2,225,900
June	102,400	58,470	79,700	5·53	6·2	4,742,500
July	88,600	44,800	65,200	4·53	5·2	4,009,000
August	43,540	21,750	30,500	2·12	2·4	1,875,400
September	28,380	14,100	20,700	1·44	1·6	1,231,700

NOTE.—Accuracy "A," up to 69,000 c.f.s. Accuracy "B," over 69,000 c.f.s. Gauge read by Meteorological Service, and discontinued on September 30. On December 1, 1911, a metering was made under partial winter conditions. Discharge, 7,180 c.f.s. On March 5, 1912, under ice cover, the discharge was 3,980 c.f.s. From gauge readings during the frozen season, it would seem that the discharge decreased gradually from 7,180 second-feet on December 1, 1911, to 3,840 second-feet on March 24, 1912, at which latter date open conditions again existed.

DAILY GAUGE HEIGHT AND DISCHARGE

Day.	March.		April.		May.		June.		July.	
	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge
	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			−0·17	4,460	3·62	18,500	10·58	64,920	10·17	61,430
2			−0·17	4,480	4·00	20,300	10·17	61,450	9·62	56,780
3			−0·08	4,660	4·17	21,080	9·87	57,180	9·17	53,060
4			0·08	4,680	4·33	21,750	9·40	55,480	9·00	51,700
5			0·08	4,900	4·38	22,300	9·12	52,660	9·00	51,700
6			0·08	5,140	4·50	22,800	8·79	50,120	9·00	51,700
7			0·08	5,140	4·71	23,850	8·54	48,180	8·96	51,380
8			0·08	5,140	5·30	25,200	8·62	48,760	8·71	49,480
9			0·12	5,260	5·42	27,500	8·90	51,380	8·38	46,940
10			0·21	5,530	6·00	30,800	9·50	55,800	8·17	45,360
11			0·33	5,890	6·29	32,540	9·50	55,800	8·08	44,660
12			0·50	6,400	6·33	32,780	9·50	55,800	8·20	45,600
13			0·62	6,760	6·42	33,300	9·87	58,830	8·08	44,660
14			0·79	7,360	6·83	35,910	10·67	65,660	8·08	44,660
15			1·08	8,340	7·38	39,760	10·50	64,200	8·20	45,600
16			1·17	8,610	7·75	42,350	11·00	68,500	7·37	39,690
17			1·42	9,580	9·25	53,750	10·87	67,360	7·62	41,430
18			1·54	10,020	9·79	58,120	10·91	69,930	7·38	39,760
19			1·71	10,640	9·58	56,440	11·17	69,930	7·25	38,850
20			1·91	11,440	9·38	54,840	11·54	73,060	7·17	38,290
21			1·95	11,600	9·38	54,840	11·67	74,230	7·17	38,290
22			2·08	12,120	9·87	58,830	12·00	77,100	7·04	37,380
23			2·21	12,540	10·38	63,220	12·12	78,060	7·25	38,850
24	0·42	3,840	2·29	12,860	10·75	66,350	12·17	78,460	7·42	40,040
25	0·33	4,040	2·50	13,700	10·96	68,140	12·00	77,100	7·25	38,850
26	0·33	4,040	2·75	14,700	11·12	69,480	11·79	75,220	7·25	38,850
27	0·25	4,250	3·00	15,800	11·38	71,720	11·71	74,580	7·29	39,130
28	0·17	4,460	3·04	15,960	11·83	75,570	11·67	74,230	7·04	37,380
29	0·17	4,460	3·00	15,800	11·87	75,930	11·54	73,060	6·79	35,630
30	0·25	4,250	3·29	17,050	11·62	73,780	10·96	68,140	6·71	35,070
31	0·17	4,360			11·08	69,140			6·71	35,070

of Thompson River, at Kamloops, for 1912.

August.		September.		October.		November.		December.		Day.
Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
6·83	35,910	4·75	23,850	2·5	13,700	1·5	9,900	1·0	8,100	1
6·83	35,910	4·71	23,650	2·5	13,700	1·7	10,600	0·8	7,400	2
6·75	35,350	4·71	23,650	2·4	13,300	1·5	9,900	0·8	7,400	3
6·71	35,070	4·75	23,850	2·5	13,700	1·5	9,900	0·8	7,400	4
6·71	35,070	4·75	23,850	2·5	13,700	1·5	9,900	0·8	7,400	5
6·67	34,790	4·62	23,200	2·4	13,300	1·3	9,100	0·7	7,000	6
6·67	34,790	4·50	22,600	2·8	14,900	1·2	8,700	0·7	7,000	7
6·29	32,540	4·50	22,600	2·6	14,100	1·2	8,700	0·7	7,000	8
6·00	30,800	4·50	22,600	2·5	13,700	1·2	8,700	0·8	7,400	9
6·08	31,280	4·50	22,600	2·5	13,700	1·2	8,700	0·8	7,400	10
6·67	34,790	4·50	22,600	2·5	13,700	1·2	8,700	0·8	7,400	11
6·91	36,470	4·50	22,600	2·4	13,300	1·2	8,700	0·8	7,400	12
6·88	36,260	4·42	22,200	2·2	12,500	1·2	8,700	0·8	7,400	13
6·50	33,700	4·42	22,200	2·1	12,200	1·2	8,700	0·8	7,400	14
6·21	32,060	4·42	22,200	2·2	12,500	1·2	8,700	0·8	7,400	15
6·12	31,520	4·25	21,400	2·1	12,200	1·0	8,100	0·8	7,400	16
5·96	30,560	4·08	20,700	2·1	12,200	1·2	8,700	0·8	7,400	17
6·17	31,820	4·00	20,300	2·2	12,500	1·1	8,400	0·7	7,000	18
5·91	30,260	3·96	20,100	2·4	13,300	1·1	8,400	0·7	7,000	19
5·83	29,780	3·79	19,350	2·5	13,700	1·0	8,100	0·8	7,400	20
6·00	30,800	3·79	19,350	2·2	12,500	1·1	8,400	0·8	7,400	21
6·12	31,520	3·50	18,000	2·0	11,800	1·2	8,700	0·8	7,400	22
6·21	32,060	3·37	17,380	2·0	11,800	1·2	8,700	0·8	7,400	23
6·46	33,500	3·25	16,850	2·0	11,800	1·2	8,700	0·7	7,000	24
6·79	35,630	3·21	16,650	2·0	11,800	1·0	8,100	0·7	7,000	25
6·67	34,720	3·00	15,800	2·0	11,800	1·0	8,100	0·5	6,400	26
6·46	33,500	3·00	15,800	2·0	11,800	1·0	8,100	0·5	6,400	27
5·62	28,600	2·83	15,020	1·8	11,000	1·0	8,100	0·7	7,000	28
5·42	27,500	2·75	14,700	1·8	11,000	1·0	8,100	0·5	6,400	29
5·21	26,350	2·75	14,700	1·8	11,000	1·0	8,100	0·5	6,400	30
5·00	25,200			1·7	10,600			0·5	6,400	31

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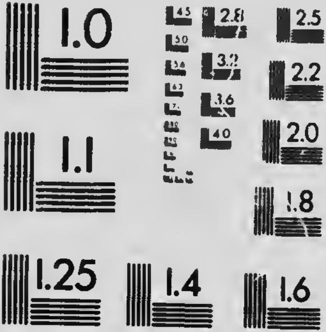
(ANSI and ISO TEST CHART No. 2)



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MONTHLY DISCHARGE of Thompson River, at Kamloops, for 1912.

(Drainage area, 14,400 square miles.)

Month.	Discharge in Second Feet.				Run Off.	
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet
April	17,050	4,460	9,217	0·64	0·71	548,630
May	75,930	18,500	45,812	3·18	3·67	2,816,100
June	78,460	48,180	64,763	4·49	5·00	3,855,900
July	61,430	35,070	43,783	3·01	3·50	2,693,200
August	36,470	25,200	32,520	2·26	2·61	1,998,300
September	23,850	14,700	20,345	1·41	1·57	1,207,900
October	11,900	10,600	12,670	·88	1·00	780,000
November	10,600	8,100	8,747	·61	·68	520,000
December	8,100	6,400	7,158	·50	·58	440,000

NOTE.—Accuracy "A," up to 60,000 c.f.s. Accuracy "B" over 60,000 c.f.s. Ice conditions existed at the station from December 1, 1911, to March 24, 1912. In that interim the discharge decreased gradually from 7,180 to 3,840 second-feet.

DISCHARGE MEASUREMENTS of Thompson River, at Spences Bridge, 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft
Oct. 25	C. E. Richardson	1048	297	2,780	3·7	4·0	10,300
Nov. 25	"	1048	340	2,435	3·4	2·8	8,180
1912.							
Feb. 17	C. G. Cline	1016	324	2,200	2·7	1·4	5,900
Mar. 30	"	1016	330	1,960	2·4	1·2	4,770
May 1	C. E. Richardson	1048	485	3,800	5·5	6·55	20,700
May 25	C. G. Cline	1046	464	8,080	10·5	15·9	84,900
July 25	B. [illegible]ould	1044	433	6,135	11·7	11·7	50,200

Gauging Station on Thompson River at Spences Bridge.

DAILY GAUGE HEIGHT AND DISCHARGE of Thompson River, at Spenees Bridge, for 1911.

Day.	November.		December.	
	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	9,200	2·7	7,540
2	....	9,000	2·8	7,750
3	....	8,800	2·8	7,750
4	....	8,600	2·5	7,130
5	....	8,400	2·4	6,930
6	3·0	8,200	2·5	7,130
	3·0	8,200	2·4	6,930
8	3·0	8,200	2·4	6,930
9	2·9	7,970	2·5	7,130
10	2·8	7,750	2·4	6,930
11	2·7	7,540	2·4	6,930
12	2·4	6,930	2·4	6,930
13	2·2	6,550	2·3	6,740
14	2·2	6,550	2·3	6,740
15	2·2	6,550	2·2	6,550
16	2·2	6,550	2·1	6,370
17	2·2	6,550	2·1	6,370
18	2·2	6,550	2·1	6,370
19	2·2	6,550	2·1	6,370
20	2·3	6,740	2·2	6,550
21	2·5	7,130	2·2	6,550
22	2·5	7,130	....	6,840
23	2·5	7,130	2·5	7,130
24	2·6	7,330	2·5	7,130
25	2·8	7,750	1·8	5,870
26	2·7	7,540	1·7	5,720
27	2·6	7,330	1·5	5,430
28	2·4	6,930	1·4	5,290
29	2·8	7,750	1·3	5,160
30	2·6	7,330	1·2	5,030
31	....	....	1·1	4,910

SESSIONAL PAPER No. 25f

MONTHLY DISCHARGE of Thompson River, at Spences Bridge, for 1911.

(Drainage area, 21,000 square miles.)

Month.	Discharge in Second Feet.			Run-Off.		
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
November	9,200	6,550	7,491	0·4	0·4	446,000
December	7,750	4,910	6,553	0·3	0·36	403,000

NOTE.—Station established October 25, 1911. Channel open all the year. Accuracy in November, "C"; in December, "B."

DAILY GAUGE HEIGHT AND DISCHARGE of

Day	January Gauge height.	January Discharge	February Gauge height.	February Discharge	March Gauge height	March Discharge	April Gauge height.	April Discharge	May Gauge height	May Discharge	June Gauge height	June Discharge
	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft	Feet	Sec.-ft.	Feet	Sec.-ft	Feet.	Sec.-ft
1	1·4	5,290	0·9	4,700	1·2	5,030	1·4	5,290		20,600	16·2	87,600
2	1·5	5,430	0·9	4,700	1·4	5,290	1·4	5,290		21,200	15·4	80,400
3	1·5	5,430	0·8	4,600	1·4	5,290	1·5	5,430		21,800	15·1	77,800
4	1·5	5,430	0·9	4,700	1·3	5,160	1·5	5,430		22,100	14·6	73,400
5	1·3	5,160	1·0	4,800	1·3	5,160	1·5	5,430		23,000	14·2	70,000
6	1·1	4,910	0·9	4,700	1·3	5,160	1·5	5,430	7·4	23,600	13·8	66,600
7	1·2	5,030	1·0	4,800	1·2	5,030	1·6	5,570	7·9	26,100	13·4	63,200
8	1·2	5,030	1·1	4,910	1·2	5,030	1·6	5,570	8·4	28,600	13·3	62,400
9	2·5	7,130	1·3	5,160	1·1	4,910	1·6	5,570	9·0	31,800	13·7	65,700
10	2·6	7,330	1·3	5,160	1·1	4,910	1·7	5,720	9·6	35,400	14·0	68,400
11	2·5	7,130	1·5	5,430	1·2	5,030	1·8	5,870	10·6	41,800	14·1	69,200
12	2·7	7,540	1·5	5,430	1·2	5,030	2·5	7,130	10·8	43,200	14·2	70,000
13	3·2	8,600	1·5	5,430	1·3	5,160	2·6	7,330	11·2	46,000	14·3	70,800
14	3·3	8,800	1·6	5,570	1·3	5,160	2·7	7,540	11·5	48,400	14·4	71,600
15	3·2	8,600	1·5	5,430	1·3	5,160	2·8	7,750	11·9	51,200	15·2	78,600
16	3·0	8,200	1·4	5,290	1·4	5,290	3·2	8,600	12·8	58,100	15·4	80,400
17	2·8	7,750	1·4	5,290	1·4	5,290	3·5	9,400	13·6	64,800	15·5	81,300
18	2·6	7,330	1·4	5,290	1·3	5,160	4·0	10,600	14·8	70,000	15·6	82,200
19	3·0	8,200	1·6	5,570	1·2	5,030	4·3	11,500	14·6	73,400	15·6	82,200
20	3·3	8,800	1·6	5,570	1·2	5,030	4·4	11,800	14·7	74,300	15·8	84,000
21	3·0	8,200	1·5	5,430	1·2	5,030	4·5	12,100	15·0	77,000	16·0	85,800
22	3·0	8,200	1·5	5,430	1·2	5,030	4·9	13,400	14·8	75,200	16·4	89,400
23	2·8	7,750	1·5	5,430	1·2	5,030	5·3	14,800	15·0	77,000	16·6	91,200
24	2·6	7,330	1·3	5,160	1·2	5,030	5·7	16,400	16·0	85,800	16·4	89,400
25	1·9	6,030	1·3	5,160	1·2	5,030	5·9	17,200	15·8	84,000	16·4	89,400
26	1·5	5,430	1·3	5,160	1·2	5,030	6·0	17,600	16·2	87,600	16·4	89,400
27	1·4	5,290	1·4	5,290	1·2	5,030		18,200	16·6	91,200	16·4	89,400
28	1·8	5,870	1·4	5,290	1·2	5,030		18,800	16·7	92,100	16·3	88,500
29	1·4	5,290	1·2	5,030	1·2	5,030		19,400	16·7	92,100	16·4	89,400
30	1·3	5,160			1·2	5,030		20,000	16·6	91,200	15·9	84,900
31	1·2	5,030			1·2	5,030			16·4	89,400		

Thompson River, at Spences Bridge, for 1912.

July.		August.		September.		October.		November.		December.		Day.
Gauge height.	Dis-charge	Gauge height.	Dis-charge	Gauge height.	Dis-charge	Gauge height.	Dis-charge	Gauge height.	Dis-charge	Gauge height.	Dis-charge	
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
15·4	80,400	10·9	43,900	8·7	30,100	...	20,700	4·2	11,200	3·3	8,800	1....
14·8	75,200	10·9	43,900	8·7	30,100	.....	20,100	4·1	10,900	3·3	8,800	2 ...
14·3	70,800	10·8	43,200	8·7	30,100	....	19,500	4·2	11,200	3·2	8,600	3....
13·7	65,700	10·7	42,500	8·6	29,600	....	18,900	4·1	10,900	3·2	8,600	4 ...
13·6	64,800	10·7	42,500	8·5	29,100	....	18,300	4·1	10,900	3·2	8,600	5 ...
13·7	65,700	10·8	43,200	8·4	28,600	......	17,700	4·0	10,600	3·2	8,600	6 ..
13·4	63,200	10·8	43,200	8·4	28,600	....	17,100	3·9	10,400	3·2	8,600	7 ...
13·2	61,600	10·8	43,200	8·4	28,600	......	16,500	3·9	10,400	3·1	8,400	8 ...
13·2	61,600	10·8	43,200	8·3	28,100	.....	15,900	3·8	10,200	3·1	8,400	9 ...
12·9	59,200	10·4	40,400	8·2	27,600	5·4	15,200	3·7	10,000	3·1	8,400	10 ...
12·6	56,800	10·3	29,700	8·2	27,600	5·4	15,200	3·7	10,000	3·0	8,200	11....
12·5	56,000	10·4	40,400	8·1	27,100	5·3	14,800	3·6	9,700	3·0	8,200	12....
12·3	54,400	10·5	41,100	8·1	27,100	...	14,400	3·6	9,700	3·0	8,200	13....
12·3	54,400	10·7	42,500	8·2	27,600	5·1	14,100	3·5	9,400	3·0	8,200	14....
12·3	54,400	10·8	43,200	8·1	27,100	5·1	14,100	3·4	9,160	3·0	8,200	15....
12·3	54,400	10·6	11,800	8·0	26,600	5·1	14,100	3·3	8,800	3·0	8,200	16....
12·1	52,800	10·6	41,800	7·8	25,600	5·1	14,100	3·3	8,800	2·9	7,970	17....
12·0	52,000	10·5	41,100	7·7	25,100	5·1	14,100	3·2	8,600	2·9	7,970	18....
11·8	50,400	10·4	40,400	7·6	24,600	5·2	14,400	3·3	8,800	2·9	7,970	19....
11·6	48,800	10·1	38,400	7·5	24,100	5·2	14,400	3·3	8,800	2·9	7,970	20....
11·4	47,400	10·1	38,400	7·4	23,600	5·2	14,400	3·3	8,800	2·9	7,970	21....
11·4	47,400	10·1	38,400	7·2	22,600	5·1	14,100	3·4	9,160	2·9	7,970	22....
11·5	48,100	10·1	38,400	7·0	21,800	5·1	14,100	3·4	9,160	2·8	7,750	23....
11·6	48,800	10·2	39,000	6·9	21,300	5·0	13,800	3·4	9,160	2·8	7,750	24 ...
11·8	50,400	10·3	39,700	6·8	20,800	4·9	13,400	3·5	9,400	2·8	7,750	25 ...
11·7	49,600	10·4	40,400	6·7	20,400	4·8	13,000	3·5	9,400	2·7	7,540	26....
11·6	48·800	10·3	39,700	6·5	19,600	4·7	12,700	3·5	9,400	2·7	7,540	27....
11·5	48,100	10·1	38,400	6·3	18,800	4·5	12,100	3·4	9,160	2·7	7,540	28....
11·3	46,700	10·0	37,800	6·7	20,400	4·4	11,800	3·4	9,160	2·7	7,540	29....
11·2	46,000	9·7	36,000	6·9	21,300	4·3	11,500	3·4	9,160	2·6	7,330	30....
10·9	43,900	9·2	33,000	......	....	4·2	11,200	.....	....	2·5	7,130	31....

MONTHLY DISCHARGE of Thompson River, at Spences Bridge, for 1912.

(Drainage area, 21,000 square miles.)

Month.	Discharge in Second Feet.				Run Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
January	8,800	4,910	6,668	0·3	0·3	410,000
February	5,570	4,600	5,169	0·25	0·3	297,000
March	5,290	4,910	5,085	0·24	0·3	312,000
April	20,000	5,290	10,338	0·5	0·6	613,000
May	92,100	20,600	57,042	2·7	3·1	3,500,000
June	91,200	62,400	79,087	3·8	4·2	4,710,000
July	80,400	43,900	55,735	2·6	3·0	3,420,000
August	43,900	33,000	40,606	1·9	2·2	2,500,000
September	30,100	18,800	25,453	1·2	1·3	1,510,000
October	20,700	11,200	15,023	0·7	0·8	923,000
November	11,200	8,600	9,681	0·5	0·6	576,000
December	8,800	7,130	8,087	0·4	0·5	497,000
The period	92,100	4,600	26,498	1·3	17·2	19,268,000

NOTE.—Accuracy, "B," except in October, when it was "C."

DISCHARGE MEASUREMENTS of South Thompson River, at near Chase, 1911-12.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
Oct. 30	C. E. Richardson	1048	415	4,450	1·3	0·71	5,780
1912.							
Mar. 1	"	1047	397	3,710	0·68	−0·83	2,380
May 18	"	1048	465	6,490	3·03	5·50	19,600
June 13	"	1048	465	7,190	4·29	7·17	30,800
June 21	"	1048	495	7,600	4·46	8·0	33,800
July 24	"	1048	465	6,200	3·18	5·0	19,600
Sept. 5	"	1049	445	5,180	2·25	2·98	11,600

Gauge Heights and Daily Discharge of South Thompson River, at Chase, for 1911.

Day.	April. Gauge height.	April. Discharge.	May. Gauge height.	May. Discharge.	June. Gauge height.	June. Discharge.	July. Gauge height.	July. Discharge.
	Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.	Feet	Sec.-ft.
1				9,210	5·17	20,280	8·33	36,050
2			2·25	9,450	5·33	21,050		35,850
3				9,900	5·75	23,050	8·25	35,650
4				10,300		24,100	8·17	35,250
5				10,900	6·17	25,150	8·0	31,400
6			2·91	11,430	6·25	25,550	8·0	34,400
7				11,200		25,750	7·91	33,850
8				10,950	6·33	25,950	7·91	33,850
9			2·67	10,710	6·33	25,950		33,850
10				10,960	6·33	25,950	7·91	33,850
11			2·83	11,190	6·42	26,400	7·83	33,450
12				11,700	6·67	27,650	7·75	33,050
13				12,200	6·75	28,050	7·58	32,200
14				12,650	7·00	29,300	7·42	31,400
15			3·42	13,080	7·33	30,950	7·33	30,950
16				13,700	7·58	32,200		30,550
17			3·75	14,300	7·08	29,700	7·17	30,150
18			3·91	14,940		32,000	6·91	28,850
19			4·25	16,300	8·17	35,250		28,200
20			4·5	17,400	8·33	36,050		27,500
21				17,900	8·33	36,050	6·5	26,800
22	1·17	6,710	4·75	18,400	8·33	36,050	6·33	25,950
23	...	6,985	4·91	19,150	8·33	36,050		25,100
24	1·42	7,260		19,350	8·33	36,050	6·0	24,300
25	1·50	7,500	5·0	19,600		36,050		23,650
26	1·67	7,840	5·0	19,600	8·33	36,050	5·75	23,050
27	1·83	8,290	5·0	19,600	8·42	36,520		22,200
28	1·91	8,530	5·0	19,600	8·42	36,520	..	21,400
29	2·0	8,800	5·0	19,600	8·42	36,520	5·25	20,650
30	...	9,020	5·0	19,600	8·33	36,050		19,900
31	...	...	5·17	20,280			4·92	19,200

Monthly Discharge of South Thompson River, at Chase, for 1911.

(Drainage area, 7,000 square miles.)

Month.	Discharge in Second Feet. Maximum	Minimum	Mean	Per sq. mile.	Run Off. Depth in inches on Drainage area.	Total in acre-feet.
May	20,280	9,240	14,680	2·09	2·41	903,900
June	36,520	20,280	30,410	4·34	3·84	1,809,000
July	36,050	19,200	29,210	4·17	4·81	1,795,000

Note. Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of

Day.	April.		May.		June.		July.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharg
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			2·75	10,950	7·83	33,450	7·5	31,800
2			2·82	11,160	7·83	33,450	7·33	30,950
3			2·91	11,430	..	33,250	7·17	30,150
4			3·00	11,700	7·75	33,050	7·0	29,300
5				11,850	7·5	31,800	6·8	28,300
6				12,000	7·33	30,950	6·7	27,800
7			3·17	12,210	7·0	29,300	6·6	27,300
8				12,600	7·0	29,300	6·4	26,300
9			3·42	13,080	7·0	29,300	6·3	25,800
10	0·08	4,260	3·58	13,640	7·0	29,300	6·2	25,300
11	0·17	4,440	3·75	14,300	7·0	29,300	6·0	24,300
12	0·25	4,600		15,000	7·08	29,700	5·9	23,800
13	0·33	4,760	4·08	15,620	7·17	30,150	5·8	23,300
14	0·42	4,940	4·17	15,980	7·33	30,950	5·7	22,800
15	0·58	5,340	4·50	17,400	7·42	31,400	5·6	22,300
16	0·67	5,540	4·83	18,720	7·50	31,800	5·5	21,900
17	0·75	5,700		20,300	7·58	32,200	5·4	21,400
18	0·91	6,030	5·50	21,900	7·67	32,650	5·3	20,900
19	1·00	6,300	5·67	22,650	7·75	33,050	5·2	20,400
20	1·08	6,460	5·17	20,280	7·83	33,450	5·1	20,000
21	1·25	6,900	6·0	24,300	8·0	34,400	5·0	19,600
22	1·33	7,060	6·25	25,550	8·08	34,800	4·9	19,100
23	1·50	7,500	6·67	27,650	8·08	34,800	4·8	18,600
24	1·67	7,800	6·83	28,450	8·08	34,800	4·7	18,200
25	1·83	8,290	6·90	28,850	8·08	34,800	4·7	18,200
26	2·00	8,800	7·0	29,300	8·08	34,800	4·7	18,200
27	2·17	9,210	7·25	30,550	8·0	34,400	4·67	18,080
28	2·25	9,450	7·5	31,800	7·91	33,850	4·60	17,800
29	2·42	9,960	7·67	32,650	7·75	33,050	4·42	17,000
30	2·58	10,440	7·83	33,450	7·67	32,650	4·33	16,620
31		......	7·83	33,450	....	....	4·33	16,620

South Thompson River, at Chase, for 1912.

August.		September.		October.		November.		December.		Day.
Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height	Discharge	
Feet.	Sec.-ft.	Feet	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	
4·30	16,500	3·12	12,060	2·2	9,300	1·6	7,700	1·2	6,800	1
4·20	16,100	3·08	11,940	2·2	9,300	1·6	7,700	1·2	6,800	2
4·12	15,780	3·04	11,820	2·1	9,000	1·5	7,500	1·2	6,800	3
4·0	15,300	2·96	11,580	2·0	8,800	1·5	7,500	1·2	6,800	4
3·96	15,140	2·91	11,430	2·0	8,800	1·5	7,500	1·2	6,800	5
3·87	14,780	2·91	11,430	2·0	8,800	1·5	7,500	1·2	6,800	6
3·8	14,500	2·96	11,580	2·0	8,800	1·5	7,500	1·2	6,800	7
3·7	14,100	3·0	11,700	2·0	8,800	1·4	7,200	1·2	6,800	8
3·66	13,940	3·0	11,700	1·9	8,500	1·4	7,200	1·1	6,500	9
3·62	13,780	3·0	11,700	1·9	8,500	1·3	7,000	1·1	6,500	10
3·6	13,700	3·0	11,700	1·9	8,500	1·3	7,000	1·1	6,500	11
3·5	13,400	3·0	11,700	1·9	8,500	1·3	7,000	1·1	6,500	12
3·5	13,400	3·0	11,700	1·8	8,200	1·3	7,000	1·2	6,800	13
3·5	13,400	3·0	11,700	1·8	8,200	1·2	6,800	1·2	6,800	14
3·5	13,400	3·0	11,700	1·8	8,200	1·2	6,800	1·2	6,800	15
3·5	13,400	2·96	11,580	1·8	8,200	1·2	6,800	1·2	6,800	16
3·5	13,400	2·91	11,430	1·8	8,200	1·2	6,800	1·2	6,800	17
3·5	13,400	2·87	11,320	2·0	8,800	1·2	6,800	1·2	6,800	18
3·5	13,400	2·83	11,190	2·0	8,800	1·2	6,800	1·2	6,800	19
3·5	13,400	2·8	1[illegible],100	2·0	8,800	1·2	6,800	1·2	6,800	20
3·5	13,400	2·7	1[illegible],800	2·0	8,800	1·2	6,800	1·2	6,800	21
3·46	13,240	2·62	[illegible],560	2·0	8,800	1·2	6,800	1·2	6,800	22
3·25	12,450	2·54	[illegible]0,320	2·0	8,800	1·2	6,800	1·2	6,800	23
3·25	12,450	2·5	10,200	2·0	8,800	1·2	6,800	1·2	6,800	24
3·25	12,450	2·46	10,080	1·9	8,500	1·2	6,800	1·2	6,800	25
3·25	12,450	2·4	9,900	1·9	8,500	1·2	6,800	1·2	6,800	26
3·37	12,880	2·35	9,750	1·9	8,500	1·2	6,800	1·2	6,800	27
3·30	12,600	2·3	9,600	1·9	8,200	1·2	6,800	1·2	6,800	28
3·25	12,450	2·25	9,450	1·8	8,200	1·2	6,800	1·2	6,800	29
3·20	12,300	2·25	9,450	1·7	7,900	1·2	6,800	1·2	6,800	30
3·17	12,210			1·7	7,900			1·2	6,800	31

MONTHLY DISCHARGE of South Thompson River, at Chase, for 1912.

(Drainage area, 7,000 square miles.)

MONTH.	DISCHARGE IN SECOND-FEET.				RUN-OFF.	
	Maximum	Minimum	Mean	Per square mile.	Depth in inches on Drainage area	Total in acre-feet
May	31,450	10,950	20,280	2·90	3·34	1,218,200
June	34,800	29,300	32,330	4·62	5·15	1,922,000
July	31,800	16,620	22,650	3·24	3·73	1,390,000
August	16,500	12,210	13,650	1·95	2·25	839,000
September	12,060	9,450	11,070	1·58	1·76	660,500
October	9,300	7,900	8,577	1·22	1·41	527,000
November	7,700	6,800	7,030	1·00	1·12	418,300
December	6,800	6,500	6,761	0·95	1·10	416,000

NOTE.—Open conditions exist nearly all year.
Accuracy, "A."

THREE-MILE CREEK.

Three-mile creek has its source in the hills between Kamloops lake and Guichon valley, at an elevation of 4,000 feet, and discharges into Kamloops lake near Savona, at an elevation of 1,200 feet. It is part of the Thompson drainage; its drainage area as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 62 square miles, of which the west fork has an area of 33 square miles, and the east of 29 square miles. This is a very contentious irrigation stream in the heart of the Dry Belt; the summers are hot and dry, the winters long and very cold (-30° F.); the mean annual precipitation is about 10 inches.

Three-mile creek has two branches, which join about 8 miles from the mouth. From the confluence to the mouth, the stream flows through a fertile valley, half a mile wide, bounded by bench lands, which would make excellent agricultural land, if the necessary water were available. There are no storage facilities on the west branch, but it is of more importance as it forms part of the Leighton diversion system (see station on Guichon creek). Mr. Leighton diverts water from Guichon creek into two small lakes, Tunkwa and Leighton, on the divide between the west branch of Three-mile creek and Guichon creek. The water is stored in these lakes, then conducted down the said west branch. The east branch has its source in a small lake from 1 to 20 acres in extent, which might be used as a storage reservoir; at present there is a 4-foot dam, but this might be greatly enlarged. During the summer of 1912 miscellaneous measurements were made near the mouth, and on the west branch; the former gives an idea of the water during the freshet, and the latter shows the amount of water in the east branch previous to the opening of the Leighton diversion gates. See miscellaneous measurements on Three-mile creek.

TOBY CREEK (122).

Toby creek is a stream about 35 miles long rising in the Selkirks, west of lake Windermere, at an elevation of from 6,000 feet to 9,000 feet. It flows in a northeasterly direction and discharges into the Columbia river 1 mile below lake Windermere, at an elevation of 2,700 feet. Toby creek varies in width from 50 feet to 2[illegible] feet and in depth from 3 feet to 6 feet. The drainage area is about 220 square mil[illegible]

The precipitation in the Toby creek drainage varies from 11 inches at the mouth to over 60 inches in the head-waters.

It deposits a great deal of silt and wash in the Columbia river and the bars at each of its two mouths are a great handicap to navigation. It has a very large freshet and, at times, it backs water into lake Windermere. Logs have floated down Toby creek and up the Columbia river 1 mile into lake Windermere.

The Columbia River Irrigated Fruitlands Company hold extensive irrigation records on this creek, and at present are constructing a flume with which they hope to irrigate thousands of acres of land along lake Windermere and the Columbia river.

The Columbia River Lumber Company hold valuable timber limits up this creek, and annually in June, July and August logs are carried down this creek to the Columbia river; then down the Columbia river 100 miles to the mill at Golden.

Power may be developed at three points on this stream.

(1) Two miles from the mouth there is a canyon 8 miles long. The fall in the canyon is 1,600 feet in 8 miles (by aneroid). At the mouth of the canyon the stream is 100 feet wide. The left bank is 100 feet high, rocky, steep, with a few scattered trees. The right bank is low, sloping and covered with heavy brush. At the head of the canyon the stream is 10 feet wide. The banks are steeply sloping and covered with heavy brush.

(2) Eleven miles from the mouth, there is a canyon 100 yards long, with a fall of 100 feet (measured by aneroid). At the foot of the canyon the stream is 50 feet wide. The banks are steeply sloping, rocky, covered with light brush and timber. The left bank rises in bluffs. At the head of the rapids the stream is 50 feet wide, the right bank steeply sloping, with light timber and brush.

(3) On Jumbo creek, 28 miles up stream, Jumbo creek enters on the left side (looking downstream). It carries about half the flow of Toby creek. On Jumbo creek there is a canyon 1,000 feet long with a head of 40 feet, of which 20 feet is a sheer fall at the head of the canyon. At the mouth of the canyon the stream is 30 feet wide with steep (20-foot) rocky banks, covered with timber. At the head of the canyon above the falls, the stream is 25 feet wide, with sloping rocky banks covered with brush. Below the falls the stream is 20 feet wide; the banks are 30 feet high and rocky. The falls have been blasted for the purpose of driving logs to the extent that now the falls are 60 feet high. An additional 20-foot head could be obtained by constructing a dam at the head of the falls. This dam would be 90 feet long. No good storage is known on Toby or Jumbo creeks.

Toby Creek (422).

The station on Toby creek was established May 28, 1912, by C. E. Richardson, assisted by H. C. Hughes. Measurements were made from the down-stream side of the traffic bridge on the road from Athalmer to Wilmer, with a Price electric current meter and cable equipment. The initial point for sounding is located at the right abutment of the bridge. The channel above and below the station is straight for 50 feet, and the water is very swift. During all stages the river passes between the bridge abutments, but in low water there are two channels, one of which is shallow and the other varies from 3 to 6 feet in depth. The stream does not flow at right angles to the bridge; in fact the current is not at all uniform. For this reason the accuracy of the measurements cannot be too closely relied upon.

A standard vertical staff gauge is fastened to the cribbing on the right bank of the stream near the Athalmer race track, and about 1 miles above the measuring section. The datum of the gauge is referred to three bench-marks.

DISCHARGE MEASUREMENTS of Toby creek, near Athalmer, 1912.

Date.	Hydrographer.	Meter No.	Width	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
May 28	C. E. Richardson..........	1055	159	359	2·2	2·0	797
June 14	H. C. Hughes......	1055	163	423	3·0	2·6	1·270
June 29 . .	"	1055	163	397	2·8	2·48	1,110
July 23	"	1055	162	378	2·5	2·25	950
Sept. 28 ...	C. E. Richardson..........	1055	75	122	2·3	0·46	270*

*Different section.

DAILY GAUGE HEIGHT AND DISCHARGE of Toby creek, near Athalmer, for 1912.

Day.	June. Gauge height.	June. Diesharge.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.	September. Gauge height.	September. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	1 6	610	2·4	1,050	2·0	795	1 1	425
2	1·58	602	2·9	1,580	1·8	700	0 9	370
3	1·4	530	2·1	850	1·9	745	0·9	370
4	1·4	530	2·1	850	1·8	700	0·9	370
5	1·42	538	2·45	1,100	1·8	700	0·95	382
6	1·5	570	2·2	910	1·85	722	0·9	370
7	1·95	770	2·15	880	1·9	745	0·9	370
8	2 3	975	2·2	910	2·1	850	1·0	395
9	2·42	1,070	2·25	940	2·0	795	1·0	395
10	2·5	1.140	2·25	940	2·25	940	1·05	410
11	2·6	1.240	2·3	975	2·0	795	1·0	395
12	..	1,380	3·3	2,120	1·6	610	1·0	395
13	2·85	1,520	3·5	2,460	1·7	655	1·1	425
14	2·65	1,300	2·68	1,330	2·1	850	....	
15	2 40	1,050	2·75	1,410	2·25	942	....	
16	2·22	923	2·55	1,190	1·6	610	....	
17	2·9	1,580	2·3	975	1·35	510	....	
18	3·7	2,850	2·1	850	1·2	455	....	
19	3 65	2,750	2 8	1,460	1·4	530	....	
20	3·65	2,750	2·75	1,410	1·7	655	....	
21	3·7	2,850	2·7	1,350	2·25	940	....	
22	4 0	3,510	2·8	1,460	2·4	1,050	....	
23	3 75	2,960	2·4	1,050	2·55	1,190	....	
24	4·1	3,750	2·1	850	2·2	910	....	
25	3 8	3,060	2·25	940	2·0	795	....	
26	3 8	3,060	2·35	1,010	1·55	590	....	
27	3·4	2,280	2·2	910	1·65	632	....	
28	2·9	1,580	1·85	722	1·0	395	0·46	270
29	2 35	1,020	2·6	1,240	1·0	295	....	
30	2 45	1,100	2·65	1,300	1·05	410	....	
31	...	....	2·5	1,140	0·9	370	....	

MONTHLY DISCHARGE of Toby creek, near Athalmer, for 1912.

(Drainage area, 220 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	3,750	530	1,660	7·5	8·4	98,800
July	2,460	722	1,170	5·3	6·1	71,900
August	1,190	370	709	3·2	3·7	43,600
September	425	270	358	1·6	1·8	21,300

NOTE.—The accuracy of the drainage area, 220 square miles, is not guaranteed. No desirable maps could be obtained. The mean discharge for September was deduced from known discharges for September 1 to 13 and September 28. Toby creek froze up in 1912 at the end of October.
Accuracy, "B."

TRANQUILLE RIVER (230).

Tranquille river is about 30 miles long, varying in width from 15 to 50 feet, and in depth from 1 to 6 feet. It rises in township 24, range 19, west of 6th meridian, at an elevation of about 6,000 feet, and discharges into Kamloops lake, whose altitude is 1,125 feet. About 3 miles from the mouth, there is a canyon 100 feet wide, with steep granite banks. Just above the canyon the right fork of Tranquille river enters; it rises in lake du Bois at an elevation of 2,600 feet. The middle fork joins the Tranquille about 4 miles above the head of the canyon, one branch of which is known as Watching creek, and rises in Pass lake (3,300 feet). The main stream, fed by the snow of the Sil-Whoia-Kun mountain (6,030 feet), comes from Tranquille lake (4,800 feet). These lakes are difficult of access, and no storage has as yet been utilized, although if necessity arose it no doubt could be obtained. The drainage basin of Tranquille river is sparsely timbered in the lower reaches, but no information about the upper part of the stream could be obtained. It is probable, however, that it is well covered with timber, as is the upper part of the Jamieson creek basin near which it lies. There are two dams on Tranquille river, both of which have fallen into disuse. They were constructed several years ago by mining interests. The upper dam, on Watching creek, was 20 feet high; the lower, about 4 miles from the mouth, was about 6 feet in height.

The station on Tranquille river was established June 4, 1911, by C. G. Cline. The measuring section is located about 20 feet above Cooney's diversion dam, and one mile and a half above the mouth. This is an excellent section; the control is good, current uniform, banks high, and there is one permanent channel. The measurements are all made by wading. A standard vertical staff gauge is located 100 yards above the dam, and its datum is referred to three bench-marks.

The drainage area is about 230 square miles. The precipitation is only about 5 to 7 inches at the mouth, and 12 inches at the source.

Discharge Measurements of Tranquille River, 1½ miles from mouth, 1911-12.

Date	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec. ft.
July 4	C. G. Cline	1046	14	17·7	1·10	0·94	19·1
Sept. 11.	"	1046	13	9·4	0·25	0·60	2·3
1912.							
Feb. 1	"	1046	12	15·4	0·5	....	8·3*
Feb. 1	"	1046	12	15·4	0·5	....	8·8*
Apr. 13	C. G. Cline, E. M. Dann	1046	11	15·2	1·2	0·96	17·8
May 7	E. M. Dann	1044	34	59·2	7·7	2·50	456·†
May 12	"	1044	36	74·5	7·7	2·70	576·†
May 25	"	1044	34	52·0	6·0	2·10	314·
June 1	"	1044	21	30·5	4·5	1·52	136·0
Aug. 2	H. J. E. Keyes	1057	13	10·3	2·0	0·88	21·0
Sept. 10	"	1057	18	19·2	1·7	1·01	33·0

*Ice cover.
†At high water section.

Daily Gauge Height and Discharge of Tranquille River, 1½ miles from mouth, for 1911.

Day.	July.		August.		September.		October.	
	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.	Gauge height.	Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	....	....	0·7	4·0	0·57	1·7	0·7	4·0
2	...	....	0·67	3·4	0·55	1·5	0·67	3·4
3	..	....	0·65	3·0	0·6	2·0	0·67	3·4
4	0·95	24	0·65	3·0	0·7	4·0	0·67	3·4
5	0·95	24	0·65	3·0	0·67	3·4	0·67	3·4
6	0·92	20	0·7	4·0	0·62	2·4	0·7	4·0
7	0·92	20	0·82	12·0	0·65	3·0	0·7	4·0
8	0·95	24	0·8	10·0	0·65	3·0	0·72	5·2
9	0·97	28	0·75	7·0	0·62	2·4	0·72	5·2
10	1·0	30	0·67	3·4	0·6	2·0	0·75	7·0
11	1·02	33	0·70	4·0	0·6	2·0	0·75	7·0
12	1·0	30	0·70	4·0	0·57	1·7	0·72	5·2
13	0·95	24	0·67	3·4	0·72	5·2	0·72	5·2
14	0·92	20	0·65	3·0	0·75	7·0	0·7	4·0
15	0·9	18	0·65	3·0	0·75	7·0	0·7	4·0
16	0·85	14	0·65	3·0	0·7	4·0	0·7	4·0
17	0·82	12	0·62	2·4	0·7	4·0	0·75	7·0
18	0·8	10	0·62	2·4	0·7	4·0	0·75	7·0
19	0·82	12	0·6	2·0	0·7	4·0	0·72	5·2
20	0·8	10	0·65	3·0	0·72	5·2	0·72	5·2
21	0·8	10	0·65	3·0	0·72	5·2	0·72	5·2
22	0·8	10	0·65	3·0	0·75	7·0		
23	0·75	7	0·65	3·0	0·75	7·0		
24	0·75	7	0·6	2·0	0·72	5·2		
25	0·75	7	0·6	2·0	0·7	4·0		
26	0·75	7	0·6	2·0	0·7	4·0	...	....
27	0·72	5	0·57	1·7	0·7	4·0		.....
28	0·72	5	0·57	1·7	0·7	4·0	...	.....
29	0·7	4	0·55	1·5	0·7	4·0		....
30	0·7	4	0·6	2·0	0·7	4·0	..	....
31	0·7	4	0·57	1·7	...	....	..	.....

MONTHLY DISCHARGE of Tranquille River, 1½ miles from mouth, for 1911.

(Drainage area, 230 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
July	33	4	13·6	0·06	0·07	836	
August	12	1·5	3·5	0·015	0·017	215	
September	7	1·5	3·93	0·017	0·019	234	
October	7	3·4	4·9	0·021	0·024	301	
The period	....	....	....	....	....	....	8 to 10

NOTE.—Station was established July 4, 1911.
Accuracy, "A."

DAILY GAUGE HEIGHT AND DISCHARGE of Tranquille River, 1½ miles from month, for 1912.

Day	March. Gauge height.	March. Discharge	April. Gauge height.	April. Discharge	May. Gauge height.	May. Discharge	June. Gauge height.	June. Discharge	July. Gauge height.	July. Discharge	August. Gauge height.	August. Discharge	September. Gauge height.	September. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·8	10	1·92	252	1·6	155	1·0	30	0·9	18		27
2			0·8	10	2·02	287	1·5	129	1·02	33		18		36
3			0·7	4	2·2	355	1·45	116	1·05	37	0·9	18	1·1	44
4			0·7	4	2·3	395	1·4	103	1·05	37		16		44
5			0·7	4	2·25	375	1·4	103	1·05	37	0·85	14	1·1	44
6			0·7	4	2·4	435	1·1	103	1·02	33		12		44
7			0·7	4	2·5	475	1·3	81	1·1	44	0·8	10	1·1	44
8			0·8	10	3·0	680	1·2	61	1·0	30		14		
9			0·9	18	3·1	720	1·2	61	1·0	30	0·9	18		
10			0·9	18	2·8	600	1·15	52	0·97	26		17		
11			0·9	18	2·6	515	1·15	52	0·95	24		16		
12			0·9	18	2·7	560	1·2	61	0·92	20	0·87	16		
13			0·95	24	2·75	580	1·2	61	0·9	18		15		
14			0·95	24	2·85	620	1·2	61		18	0·85	14		
15			1·0	30	2·9	640	1·22	65	0·9	18		12		
16			1·02	33	2·7	560	1·2	61		14	0·8	10		
17			1·05	37	2·5	475	1·15	52	0·8	10		12		
18			1·05	37	2·3	395	1·15	52		10		14		
19			1·07	40	2·2	355	1·1	44	0·8	10		16		
20			1·1	44	2·2	355	1·05	37		10	0·9	18		
21			1·17	56	2·1	435	1·05	37	0·8	10		17		
22			1·25	71	2·35	415	1·0	30		24	0·87	16		
23			1·3	81	2·3	395	1·0	30	1·05	37		13		
24			1·32	85	2·3	395	0·97	26		40	0·8	10		
25			1·35	92	2·1	315	0·95	[illegible]	1·1	44		10		
26			1·37	96	2·1	315	0·92	20		40	0·8	10		
27			1·45	116	2·1	315	0·9	18		35		13		
28			1·5	129	1·9	245	0·9	18		30		16		
29	0·7	4	1·75	195	1·8	210	1·05	37		26	0·9	18		
30	0·8	10	1·9	245	1·7	180	0·95	24		22		18		
31	0·8	10			1·7	180			0·9	18	0·9	18		

Monthly Discharge of Tranquille River, 1½ miles from mouth, for 1912.
(Drainage area, 230 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	245	4	51·9	0·23	0·26	3,090	
May	720	180	420	1·8	2·1	25,800	
June	135	18	59·1	0·26	0·29	3,520	
July	44	10	26·3	0·11	0·13	1,620	
August	18	10	14·7	0·07	0·08	904	
The period							10 to 12

Note.—Station maintained during irrigation season only.
Accuracy, "A."

Twaal Creek (206).

Twaal creek rises in the hills in the northwest boundary of township 18, range 25, west 6th meridian, at an elevation of 2,500 feet. It flows in a southeasterly direction for 12 miles, discharging into Thompson river 3 miles above Spences Bridge, at an elevation of 750 feet. It is a small stream about 5 feet wide, from 6 inches to 1 foot deep, flowing with a velocity of 0·5 feet to 1·5 feet per second. There are several falls of 10 feet on the stream, the valley is very narrow and the banks steep. A trail follows the creek practically to the source. The upper part of the valley broadens out a little, and in it there is some good agricultural land. This land is all included in Cook's Ferry Indian Reserve No. 4 and 6. Three hundred inches of water is recorded by Messrs. Moren and Curnow from Twaal creek to irrigate lots 23, 378 and 28 G. 1. Throughout the irrigation season about 4 c.f.s. of water reaches Mr. Moren's upper diversion. The ditches are long and the soil gravelly so there is generally a scarcity of water. The Indians on the reserve up the creek also have records, but of a later date, and at times they divert the creek over their land. Twaal creek is a very contentious irrigation stream.

The hydrographic station established in June, 1911, and maintained till October 1, 1911, showed that about 4 second-feet of water reached Moren's upper diversion. Miscellaneous measurements in 1912 showed the flow to be about the same.

Discharge Measurements of Twaal Creek above Moren's Diversion, for 1911-12.

Date.	Hydrographer.	Meter No.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
June 21	C. E. Richardson	1,048	6·7	2·2	1·5	0·59	3·4*
Sept. 17	" "	1,048	12·5	3·9	1·3	0·66	5·1*
June 21	" "	1,048	7·5	6·9	0·8	....	5·8†
1912.							
May 20	C. G. Cline	1,046	6·5	1·5	2·1	....	3·2*
June 27	B. Corbould	1,053	4·0	1·4	2·8	....	3·9*
July 19	"	1,053	4·2	1·5	3·1	....	4·6*
Aug. 9	"	1,044	7·3	2·1	2·1	....	4·5*

*Above Moren's Diversion.
†Above Indian Diversion.

GAUGE HEIGHTS AND DAILY DISCHARGE of Twaal Creek above Moren's Diversion, for 1911.

Day.	June. Gauge height.	June. Discharge.	July. Gauge height.	July. Discharge.	August. Gauge height.	August. Discharge.	September. Gauge height.	September. Discharge.
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·6	3·6	..	3·6		4·8
2				3·6		3·6	0·65	4·8
3				3·6	0·6	3·6		4·8
4				3·6		3·7		4·8
5				3·6		3·8		4·8
6			0·6	3·6		4·0	0·65	4·8
7				3·6	0·62	4·2		4·8
8			0·6	3·6		3·9		4·8
9			0·6	3·6		3·7		4·8
10				3·6	0·6	3·6	0·65	4·8
11				3·6		3·8		4·8
12			0·6	3·6		4·0		4·8
13				3·6		4·2		4·8
14				3·6		4·4		4·8
15				3·6		4·6		4·8
16			0·6	3·6		4·8		4·8
17				3·6	0·65	4·8	0·65	4·8
18				3·6		4·8		5·0
19				3·6		4·8		5·2
20			0·6	3·6		4·8		5·4
21	0·6	3·6		3·6	0·65	4·8		5·7
22		2·9		3·6		4·8		5·9
23		2·3	0·6	3·6		4·8		6·2
24	0·5	1·6		3·6	0·65	4·8	0·7	6·4
25		2·1		3·6		4·8		6·1
26		2·6		3·6		4·8		5·9
27		3·1	0·6	3·6	0·65	4·8		5·6
28	0·6	3·6		3·6		4·8		5·4
29		3·6		3·6	0·65	4·8		5·2
30	...	3·6	0·6	3·6		4·8		4·9
31				3·6		4·8		...

MONTHLY DISCHARGE of Twaal Creek, above Moren's Diversion, for 1911.

(Drainage area, 30 square miles.)

Month.	Discharge in Second Feet. Maximum.	Minimum.	Mean.	Per sq. mile.	Run-Off. Depth in inches on Drainage area.	Total in acre-feet.
July	3·6	3·6	3·6	0·12	0·14	220
August	4·8	3·6	4·4	0·11	0·16	270
September	6·4	4·8	5·2	0·17	0·19	310

NOTE.—Station discontinued September 30, 1911. Accuracy "D." Curve is based on 2 measurements. See miscellaneous measurements made in 1912. Winter conditions exist for 3 months of the year.

VENABLES CREEK (207).

Venables creek has its source at the foot of White mountain, north of Spences Bridge, at an elevation of 6,000 feet, and discharges into Thompson river, 6 miles north of Spences Bridge, at an elevation of 820 feet. It is part of the Thompson drainage; the drainage area, as estimated, is 13 square miles; of this, 10 square miles is above the gauge.

Venables creek is a small irrigation stream, lying between Oregon Jack and Twaal creeks. It has only a small watershed, and is dry most of the year. During the spring freshet, however, there is often a good discharge from White mountain; this water is stored in Venables lake, and is used for irrigation later in the season. The lake is a mile and a half long, half a mile wide, at an altitude of 2,230 feet. This provides a good reservoir, and it is possible to use all the freshet flow to advantage. There is probably considerable loss by seepage, however, because in the canyon below there is a spring which runs all the year round, and which is large enough for the Indians to irrigate with. Venables valley, in which the lake is situated, is about 6 miles long, and from half to a mile wide; it contains several thousand acres of good land, part of which can be irrigated from Venables lake and is being farmed to advantage. The main drawback is the storage of water in dry years, and the comparatively high altitude, 2,000 feet. The land above the lake cannot be irrigated by a gravity system, as the stream runs dry. There is also some good land at the mouth of the creek, held principally by Indians. Between this section and the valley, there is a deep canyon in which the creek bed falls 1,400 feet in two miles. There is rarely any water in this section of the stream, except where the spring rises; even the freshet water is held back by the dam on the lake. The original route of the Yale-Cariboo road was through the Venables valley, and the land was taken up at that time. Later, when the C.P.R. was built on the opposite side of Thompson river, the route was changed, and the valley was left isolated. Now, however, the C.N.R. is being constructed near the valley, and conditions may improve.

The river station on Venables creek was established May 6, 1912, by C. G. Cline. The measuring section is located in the Venables valley, 100 feet above the lake. This is a fairly good section, the control is good, the current uniform, the banks high, and there is one channel; the bed of the latter, however, is mud, and is subject to trampling by cattle. A standard staff gauge is located at the measuring section on the right bank.

DISCHARGE MEASUREMENTS of Venables Creek (207), above Venables Lake, 1912.

Date.	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
			Feet.	Sq. ft.	Ft. per sec	Feet.	Sec.-ft.
May 6	C. G. Cline	1,046	3·5	1·0	0·6	2·48	0·6
" 17	"	1,046	3·0	0·9	0·8	2·59	0·7
June 20	C. G. Cline and B. Corbould					2·10	0·0*

*Creek dry.

GAUGE HEIGHTS AND DAILY DISCHARGE of Venables Creek, above Venables Lake, for 1911.

Day.	May.		June.		July.		August.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1		0·55		0·47		0·2		0·0
2		0·55		0·46	2·3	0·3	2·1	0·0
3		0·55	2·4	0·43		0·35		0·05
4		0·55		0·38		0·40		0·10
5		0·55		0·30	2·4	0·45	2·2	0·15
6	2·47	0·55		0·23		0·45		0·15
7		0·56	2·2	0·15		0·45		0·15
8		0·57		0·10		0·45		0·15
9		0·58		0·05	2·4	0·45	2·2	0·15
10	2·5	0·60	2·1	0·0		0·43		0·15
11		0·59		0·0		0·41		0·15
12		0·59		0·0		0·40	2·2	0·15
13	2·49	0·58		0·0	2·35	0·38		0·18
14		0·62	2·1	0·0		0·35		0·21
15		0·66		0·0		0·32		0·24
16		0·70		0·0	2·3	0·30		0·27
17		0·73	2·1	0·0		0·25	2·3	0·30
18	2·6	0·76		0·0		0·20		0·30
19		0·77		0·0	2·2	0·15		0·30
20		0·78		0·0		0·19	2·3	0·30
21	2·62	0·79		0·0		0·23		0·28
22		0·85	2·1	0·0		0·27		0·26
23	2·7	0·92		0·0	2·3	0·30		0·21
24		0·90		0·0		0·25	2·25	0·22
25	2·67	0·87	2·1	0·0		0·20		0·22
26		0·81		0·0		0·20	2·25	0·22
27	2·6	0·76		0·0	2·2	0·15		0·20
28		0·69	2·1	0·0		0·10		0·20
29		0·62		0·0		0·05		0·18
30		0·55		0·1	2·1	0·0		0·17
31	2·42	0·48				0·0	2·2	0·15

MONTHLY DISCHARGE of Venables Creek, above Venables Lake, for 1912.

(Drainage area, 10 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rainfall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
May	0·92	0·48	0·67	0·07	0·08	41	
June	0·47	0·0	0·09	0·01	0·01	5	
July	0·45	0·0	0·28	0·03	0·03	17	
August	0·3	0·0	0·19	0·02	0·02	12	
The period							10

NOTE.—Station maintained during irrigation season only.
Accuracy, "C."

Viola Creek (121).

Viola creek flows into Coquitlam lake from the east in section 8, township 5, range 6, west of the 7th meridian. Its flow, added to that of the Coquitlam river as given by the gauging station above the lake, will give the amount of water available for use by the Vancouver Power Company. The other small streams which flow into the lake itself will probably provide sufficient water for the city of New Westminster.

The gauging station on the creek is in a flat about 300 yards from the mouth. The meter measurements are made by wading. The station was established on October 26, 1912, and gauge readings are being taken three times a week. During the season of 1913 sufficient meter measurements will be taken to develop the rating curve. The station is below the 30-foot contour, and when the lake is raised to the level the gauge will be flooded. If it is desired to continue the gaugings after that it will be necessary to go some distance farther up the stream to get a good station.

On October 26, 1912, the discharge was 258 c.f.s.

Warren Creek (305).

Warren creek has its source in the Spa hills, about 20 miles southwest of Salmon Arm, at an elevation of 1,000 feet and, flowing in a southwesterly direction, discharges into Salmon river, about a mile below the mouth of Bolean creek, at an elevation of about 1,700 feet. It is part of the Salmon-Shuswap lake, South Thompson drainage; the drainage area, as measured from the Geological Survey map, dated 1895, scale 2 miles to an inch, is 10 square miles. This is an irrigation stream situated at the easterly limit of the Dry Belt; the precipitation varies from 15 to 18 inches.

Warren creek is about 3 miles long; at high water it is 6 feet wide, 1 foot deep, and has a mean velocity of 3 feet per second; at low water the creek is very small, discharging less than half a second foot. The three records on the creek (under the name Ferris creek) total 420 miners inches (11. 7 c.f.s.) which is more than the flow of the creek, except during the month of May. But the recorded quantity of water is also greatly in excess of the amount required by the appurtenant lands. If the water were properly conserved, there would be sufficient to irrigate 500 acres in an average year. This might be done by storing water in Spanish lake, a small lake at the source of the stream. About 300 yards from the mouth, the creek has a fall of 75 feet which could be used for a small power development during May and June, but the flow of water is too small during the rest of the year to be of any service.

The river station on Warren creek was established May 22, 1911, by C. E. Richardson. The measuring section is located about a third of a mile from the mouth, 300 yards above a 40-foot water fall, about a quarter of a mile from the Armstrong-Grand Prairie wagon road. The measurements are all made by wading. This is an excellent section, the control is good, the banks high, the current uniform, and there is only one channel, with a permanent bed. A standard vertical staff gauge is located on the left bank of the stream about 20 feet above the measuring section. The datum of the gauge is referred to three bench-marks.

DISCHARGE MEASUREMENTS of Warren Creek, above Warren's Diversion, 1911-12.

Date	Hydrographer.	Meter No	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge
1911.			Feet.	Sq. ft.	Ft per sec.	Feet	Sec.-ft
May 22...	C. E. Richardson.	1 018	6·0	3·6	3·1	1·00	11·2
May 23...	"	1 048	7·2	3·7	2·9	0·96	10·7
May 23.	C. G. Cline.	1 046	6·0	6·5	1·2	0·96	8·4
May 23..	W. M. Carlyle	1 044	7·5	4·8	2·0	0·96	9·9
May 22..	"	1 014	9·0	7·7	1·3	1·00	10·0
June 16.	"	1 014	8·0	4·0	0·6	0·61	2·4
July 11..	"	1 044	8·5	4·3	0·6	0·64	2·6
July 25	"	1 041	4·5	2·5	0·3	0·50	0·7
1912.							
May 13.	C. E. Richardson.	1 018	6·0	5·7	3·3	1·23	18·6
July 16	"	1 018	5·2	2·5	0·7	0·58	1·8

DAILY GAUGE HEIGHT AND DISCHARGE of Warren Creek, above Warren's Diversion, for 1911.

Day.	May.		June.		July.		August.		September.	
	Gauge height.	Discharge	Gauge height.	Discharge	Gauge height	Discharge	Gauge height.	Discharge	Gauge height.	Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft
1			0·80	5·8	0·55	1·5	0·45	0·6	0·40	0·3
2	0·80	5·8	0·80	5·8	0·55	1·5	0·42	0·4	0·42	0·4
3	0·80	5·8	0·80	5·8	0·55	1·5	0·40	0·3	0·45	0·6
4			0·78	5·4	0·52	1·2	0·40	0·3	0·45	0·6
5			0·75	4·7	0·50	1·0	0·40	0·3	0·42	0·4
6			0·72	4·1	0·50	1·0	0·45	0·6	0·42	0·4
7			0·70	3·7	0·60	2·1	0·50	1·0	0·41	0·4
8			0·68	3·3	0·66	3·0	0·45	0·6	0·40	0·3
9			0·68	3·3	0·66	3·0	0·42	0·4	0·40	0·3
10			0·65	2·9	0·66	3·0	0·42	0·4	0·40	0·3
11			0·65	2·9	0·64	2·7	0·42	0·4	0·40	0·3
12			0·65	2·9	0·62	2·4	0·42	0·4	0·40	0·3
13.			0·65	2·9	0·58	1·9	0·42	0·4	0·48	0·9
14			0·62	2·4	0·50	1·0	0·42	0·4	0·45	0·6
15			0·60	2·1	0·50	1·0	0·40	0·3	0·45	0·6
16			0·60	2·1	0·50	1·0	0·40	0·3	0·44	0·6
17			0·55	1·5	0·48	·9	0·40	0·3	0·42	0·4
18			0·55	1·5	0·48	·9	0·45	0·6		
19			0·55	1·5	0·48	·9	0·45	0·6		
20			0·52	1·2	0·48	·9	0·45	0·6		
21			0·52	1·2	0·48	·9	0·44	0·6		
22	1·00	10·9	0·55	1·5	0·49	·9	0·45	0·6		
23	0·95	9·6	0·52	1·2	0·49	·9	0·45	0·5		
24	0·90	8·2	0·52	1·2	0·46	·7	0·42	0·4		
25	0·88	7·8	0·52	1·2	0·45	·6	0·42	0·4		
26	0·85	7·0	0·52	1·2	0·45	·6	0·42	0·4		
27.	0·82	6·3	0·52	1·2	0·42	·4	0·42	0·4		
28	0·82	6·3	0·52	1·2	0·42	·4	0·40	0·3		
29	0·80	5·8	0·55	1·5	0·42	·4	0·40	0·3		
30	0·80	5·8	0·58	1·9	0·42	·4	0·40	0·3		
31	0·80	5·8			0·42	·4	0·40	0·3		

MONTHLY DISCHARGE of Warren Creek, above Warren's Diversion, for 1911

(Drainage area, 10 square miles.)

Month	Discharge in Second Feet: Maximum	Minimum	Mean.	Per sq. mile.	Run-Off: Depth in inches on Drainage area	Total in acre-feet.	Rainfall: Inches.
June	5·8	1·2	2·6	·3	·3	160	
July	3·0	0·4	1·3	·1	·1	80	
August	1·0	0·3	0·4	·04	·05	2[illegible]	
The period							5

NOTE.—Station discontinued on September 17 being past the irrigation season.
Accuracy, "A."

GAUGE HEIGHTS AND DAILY DISCHARGE of Warren Creek, above Warren[illegible], for 1912.

Day.	April. Gauge height	April. Discharge	May. Gauge height	May. Discharge	June. Gauge height	June. Discharge	July. Gauge height	July. Discharge	August. Gauge height	August. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1	0·45	0·6	0·80	5·6	0·80	5·6	0·60	2·[illegible]		
2	0·45	0·6	0·80	5·6	0·80	5·6	0·60	2·[illegible]	·55	
3	0·45	0·6	0·90	7·9	0·80	5·6		[illegible]		
4	·45	0·6	0·90	7·9	0·75	4·6		3·[illegible]	0·55	
5	·45	0·6	0·95	9·2		4·1		3·[illegible]		
6	0·45	0·6	1·00	10·6	0·70	3·6		1·[illegible]	0·52	
7	0·45	0·6	1·00	10·6	0·70	3·6	0·70	3·[illegible]		
8	0·45	0·6	1·10	13·7	0·70	3·6	0·65	2·8	0·52	
9	0·45	0·6	1·15	15·5	0·70	3·6	0·65	2·8		
10	0·45	0·6	1·15	15·5	0·65	2·8		2·7	0·60	
11	0·55	1·5	1·10	13·7		3·2		2·5		
12	0·60	2·1		15·5	0·70	3·6		2·3	0·60	
13	0·50	1·0	1·20	17·4	0·70	3·6	0·60	2·1		
14	0·60	2·1	1·20	17·1	0·70	3·6	0·60	2·1	0·55	
15	0·65	2·8	1·40	26·2	0·70	3·6		2·0		1
16	0·65	2·8	1·40	26·2		3·6		1·[illegible]	0·55	1·[illegible]
17	0·65	2·8	1·20	17·4	0·70	3·6		1·8		1·5
18		2·8	1·20	17·1	0·70	3·6		1·8	0·55	1·5
19	0·65	2·8	1·20	17·4	0·65	2·8		1·7		1·[illegible]
20	0·65	2·8	1·20	17·1	0·65	2·8		1·6	0·55	1
21	0·65	2·8	1·20	17·4	0·65	2·8	0·55	1·5		1
22	0·65	2·8	1·20	17·4	0·65	2·8		1·5	0·55	1·5
23	0·65	2·8	1·20	17·1	0·65	2·8	0·55	1·5		1·5
24	0·70	3·6	1·20	17·4	0·65	2·8		1·5	0·55	1·5
25	0·70	3·6	1·30	21·6	0·60	2·1	0·55	1·5	0·55	1·5
26		4·1	1·30	21·6	0·60	2·1		1·5		1·5
27	0·75	4·6	1·00	10·6		2·1	0·55	1·5	0·55	1·5
28		5·1	1·00	10·6	0·60	2·1		1·5		1·5
29	0·80	5·6	0·90	7·9	0·60	2·1	0·55	1·5	0·55	1·5
30	0·80	5·6		6·8		2·1		1·5		1·5
31			0·80	5·6			0·55	1·5		1·5

MONTHLY DISCHARGE of Warren Creek, above Warren's Diversion, for 1912

(Drainage area, 10 square miles.)

Month.	Discharge in Second Feet.				Run Off.		Rain-fall
	Maximum	Minimum	Mean	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches
April	5·6	0·6	2·3	0·2	0·2	137	
May	26·2	5·6	14·3	1·4	1·6	879	
June	5·6	2·1	3·4	·3	·3	202	
July	4·1	1·6	2·1	·2	·2	129	
August	2·4	1·2	1·6	·2	·2	98	
The period							18

NOTE.—Station observed only during the irrigation season. The creek is frozen for four months during the winter, during which time the run-off is very small.
Accuracy, "A."

WITCH CREEK (258)

Witch creek has its source in Highland valley in section 1, township 18-23-6, at an elevation of 4,000 feet, and discharges into Guichon creek from the east, about 7 miles from Mamit lake, at an elevation of 3,300 feet. It is a part of the Guichon Nicola-Thompson drainage; the drainage area, as measured from a Geological Survey map, dated 1895, scale 2 miles to an inch, is 41 square miles; 40 miles of this area is above the station. This is an irrigation stream, governed by the water records on Guichon creek below Mamit lake. The stream is in the heart of the Dry Belt; the summers are hot and dry, the winters long and cold; the annual precipitation is about 15 inches.

Witch creek rises in the range hills in Highland valley, its main feeder being Divide lake at an elevation of 3,960 feet. A mere trickle at low water, the stream is 20 feet wide, two feet deep, with a mean velocity of 3·5 feet at high water. There are several small Indian reserves along the creek, but there is no agriculture as the Indians only live there for a short time in the summer. Beaver dams and meadows serve to store the water, but it is necessary to blow up the dams to obtain water in the late summer. The creek is not important except as a tributary of Guichon creek, a very contentious irrigation stream.

The river station on Witch creek was established September 14, 1911, by W. M. Carlyle, though no data was obtained until April, 1912. The measuring section is located at the highway bridge on the road between Chartrand's ranch and Ashcroft, which crosses the stream about 1 mile from the Savona-Merritt road. A standard vertical staff gauge is located on the downstream side of the bridge. Measurements are made by wading, except at very high water, when cable measurements are taken.

Discharge Measurements of Witch Creek, near mouth, 1911-12.

Date.	Hydrographer.	Meter No.	Width	Area of section	Mean velocity	Gauge height	Discharge
1911.			Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.
Sept. 14	W. M. Carlyle	1044	3·8	2·0	0·34	0·54	0·7
1912.							
Apr. 27	H. J. Keys	1057	12·0	5·2	1·3	0·85	6·7
May 14	"	1057	17·5	21·5	3·4	2·05	74·0
May 21	"	1057	18·0	18·6	2·9	1·75	51·1
June 3	"	1057	15·0	8·5	1·71	1·20	14·5
June 10	"	1057	12·0	5·8	1·77	0·94	10·3
June 21	"	1057	10·0	3·8	0·82	0·70	3·1
July 2	"	1057	10·5	5·2	1·43	0·85	7·5
July 15	"	1057	10·0	4·7	1·07	0·76	5·0
July 30	"	1057	10·0	3·4	0·9	0·65	3·0
Sept. 3	"	1057	10·0	5·9	1·4	0·93	7·1

GAUGE HEIGHTS AND DAILY DISCHARGE of Witch Creek, near mouth, for 1912.

Day.	April. Gauge height	April. Discharge	May. Gauge height.	May. Discharge	June. Gauge height.	June. Discharge	July. Gauge height.	July. Discharge	August. Gauge height.	August. Discharge	September. Gauge height.	September. Discharge	October. Gauge height.	October. Discharge
	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
1			0·9	8·0		19·2		3·7		1·3	1·0	11·0		2·8
2	1·3	22·0		9·5	1·2	17·7		5·9	0·6	1·5		10·0	0·67	2·7
3		19·8	1·0	11·0		16·5	0·9	8·0		1·9		9·0		2·1
4	1·2	17·7		11·0		15·3		6·1	0·65	2·3	0·9	8·0	0·6	1·5
5		12·8	1·0	11·0	1·1	14·2	0·75	4·3		2·0		9·5		
6	0·9	8·0		12·6		12·2		5·8		1·7	1·0	11·0		
7		8·0	1·1	14·2	0·97	10·1	0·87	7·2	0·6	1·5		9·8		
8		8·0		23·3		10·1		6·4		1·5	0·92	8·6		
9	0·9	8·0	1·5	32·5	0·97	10·1		5·6	0·6	1·5		7·6		
10		9·5		34·1		9·6	0·77	4·8		7·1		6·6		
11		11·0	1·55	35·7		9·1		4·0	1·05	12·6	0·8	5·5		
12	1·05	12·6		41·1		8·6	0·7	3·2		11·1		5·5		
13		11·6	1·7	46·5	0·9	8·0		5·0		9·6	0·8	5·5		
14		10·6		61·3		8·0	0·85	6·7	0·9	8·0		4·6		
15	0·95	9·5	2·0	76·0	0·9	8·0		5·0		8·0	0·72	3·7		
16		8·2		81·5		8·0		3·3	0·9	8·0		3·5		
17		6·9	2·1	87·0	0·9	8·0	0·6	1·5		15·0		3·3		
18	0·8	5·5		71·0		6·7		1·5	1·3	22·0	0·7	3·2		
19		5·5	1·8	55·0	0·8	5·5	0·6	1·5		16·9		3·2		
20	0·8	5·5		55·0		5·5	1·1	14·2		11·8	0·7	3·2		
21		5·5		55·0	0·8	5·5		12·3	0·85	6·7		2·5		
22	0·8	5·5	1·8	55·0		5·5	...	10·4		6·1	0·62	1·8		
23		5·5		47·0	0·8	5·5	...	8·5	0·8	5·5		2·4		
24	0·8	5·5	1·6	39·0		4·2	0·85	6·7		6·1		3·0		
25		6·7		35·7		2·9		5·7	0·85	6·7	0·72	3·7		
26	0·9	8·0	1·5	32·5	0·6	1·5	0·77	4·8		6·7		3·4		
27		7·6		27·2		1·5		3·6		6·7	0·7	3·2		
28		7·2	1·3	22·0	0·6	1·5	0·65	2·3	0·85	6·7		3·2		
29	0·85	6·7		22·0		1·5		1·9		16·9	0·7	3·2		
30		7·4	1·3	22·0	0·6	1·5		1·5	1·4	27·0		3·0		
31		...		20·6		...	0·55	1·1		19·0		...		

MONTHLY DISCHARGE of Witch Creek, near mouth, for 1912.
(Drainage area, 40 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.		Rain-fall.
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.	Inches.
April	22·0	5·5	9·2	0·23	0·26	550	
May	87·0	8·0	37·3	9·93	1·08	2,300	
June	19·2	1·5	8·0	0·2	0·22	480	
July	14·2	1·1	5·2	0·13	0·15	320	
August	27·0	1·3	8·4	0·21	0·24	520	
September	11·0	1·8	5·4	0·135	0·15	320	
The period							12

NOTE. Station was established on September 14, 1911, and one measurement taken on that date; discharge, 0·[illegible] second-feet. Records were commenced on April 2, 1912, and continued to October 4, 1912. Gauge readings were taken only twice a week.

Accuracy, "A."

YOHO RIVER (415).

Yoho river has its source in Wapta ice fields, 20 miles north of Field, and flows in a south-by-southeasterly direction, discharging into Kicking Horse river, 5 miles east of Field. It is a rapid mountain stream, 20 miles long, varying in width from 40 feet to 150 feet, and in depth from 2 feet to 6 feet. The tributaries (going upstream) in ascending order are: Takakkak falls from the right, Little Yoho river from the left, and Twin falls from the left. The drainage area of the stream is 75 square miles. The annual precipitation is over 90 inches, of which from 40 inches to 50 inches is snow. The run-off depth in inches in 1912 exceeded 90 inches, but no run-off factor can be obtained, as it is known that the glaciers are receding. The winter conditions are severe (—40 F.) while the summers are hot, with considerable rain.

The scenic beauty of Yoho valley is well known. Thousands of tourists annually drive up the valley to see the famous Takakkak falls, where the water is seen to fall 1,250 feet. Many of these ride up the valley to see the beautiful Twin falls and the various glaciers and snowfields.

Two small power developments are possible. A head of 80 feet may be obtained in 300 yards from the mouth upstream, and, by damming, a small pondage is practicable. By placing the power site along Kicking Horse river below the mouth of the Yoho a head of 120 feet is obtainable. About 2 miles from the mouth there is a canyon 5 miles long, 50 feet wide at the bottom, and 300 feet at the top. The walls are of a solid granite formation. The fall is 400 feet in the 5 miles, but a head of 300 feet could be obtained by constructing a high narrow dam at the foot of the canyon. There is a good power site at the foot of the canyon on the east bank. Any power would have frazil ice to contend with, extremely severe winter conditions to meet, and a good flow for only the summer months.

On June 5, 1912, a metering was made by C. E. Richardson, and a discharge of 127 c.f.s. obtained.

A gauge was established on Yoho river on June 5, 1912, by C. E. Richardson, but it was carried away by the heavy freshet at the end of June. The discharge of Yoho river, however, was determined from the difference between the daily discharges of Kicking Horse river at Field and at No. 2 tunnel, *i.e.*, below and above the mouth of the Yoho. The discharges, as deduced, are here given.

DAILY DISCHARGE of Yoho River, near mouth, for 1912.

Day.	July. Discharge.	August. Discharge.	September. Discharge.	October. Discharge.
	Sec.-ft.	Sec.-ft.	Sec.-ft.	Sec.-ft.
1	1,630	2,330	445	140
2	1,770	2,310	350	125
3	1,280	2,590	310	132
4	1,410	2,730	265	140
5	1,560	2,350	255	132
6	1,530	1,480	235	125
7	1,360	1,710	245	125
8	1,220	1,960	245	125
9	1,450	2,350	245	110
10	1,280	2,020	265	110
11	1,660	1,720	330	110
12	1,450	1,410	420	95
13	1,590	1,270	400	95
14	900	1,590	310	95
15	1,470	1,740	295	105
16	1,460	1,530	295	105
17	1,680	1,030	250	105
18	1,820	960	215	105
19	1,790	1,040	175	105
20	1,870	1,250	155	90
21	1,730	1,580	165	90
22	2,050	1,890	165	90
23	1,870	2,450	135	90
24	1,790	2,390	138	90
25	1,710	3,220	130	90
26	1,300	2,230	130	90
27	1,160	1,800	122	100
28	1,260	1,300	125	100
29	1,900	820	125	90
30	2,390	616	125	90
31	2,450	500	....	90

MONTHLY DISCHARGE of Yoho River, near mouth, for 1912.

(Drainage area, 75 square miles.)

Month.	Discharge in Second-Feet.				Run-Off.	
	Maximum	Minimum	Mean.	Per sq. mile.	Depth in inches on Drainage area.	Total in acre-feet.
June	3,800	100	1,580	21·1	23·5	94,000
July	2,450	900	1,610	21·5	24·8	99,000
August	3,390	500	1,780	23·7	27·4	109,000
September	445	125	285	3·0	3·3	14,000
October	140	90	106	1·4	1·6	6,500

NOTE.—The above results are deduced by taking the difference between the discharges at the gauging station at Field (below the mouth of the Yoho) and the discharges at the gauging station at No. 2 tunnel (above the mouth of the Yoho river). Estimated minimum flow (during the winter) = 50 c.f.s.

Accuracy, "B."

PART III

MISCELLANEOUS DISCHARGE MEASUREMENTS

MISCELLANEOUS DISCHARGE MEASUREMENTS.

NOTE.—Streams marked with an asterisk are those on which stations have been established, but daily discharges are not yet computed.

Date.	Name of Stream.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.	Remarks.
		Feet.	Sq. ft.	Ft.per sec.	Feet	Sec.-ft.	
Sept. 13, 1912	*Akolkolex river...	33	176	3·7	5·3	655·	
May 8, 1912	Alkali creek	7·5	5·4	2·1	0·4	11 3	A tributary of Cherry creek.
May 18, 1912..	"	5·2	2·1	1·8	−0·1	3·8	
May 29, 1912.	"	1 1	0·2	5·7	−0·15	1·3	
July 20, 1912	"	1 0	0·1	2 0	−0·5	0·1	
July 11, 1912	Bear creek	18	20	1·2	3·3	25·	A tributary of Adams river.
July 15, 1912	Beard creek......	6	3·4	1·3	0·66	4·3	A tributary of upper Columbia river
Oct. 21, 1912.	*Belknap creek.	33	51	0·7	1·6	33·7	
May 10, 1911.	Blue-earth creek	6	3·0	0·45	0·38	1·4	
May 18, 1911.	" ..	7	4·4	0·9	0·52	4·0	
June 2, 1911	"	5	1·8	1·1	0·42	1·9	
Aug. 20, 1912.	"	3	1·0	1·2		1·2	
Nov. 3, 1911	*Boulder creek ..	28	24	0 5	10·8	12·6	A tributary of Jones creek.
Sept 18, 1912	"	30	24	0·6	20 75	13·4	
Oct. 19, 1912	*Brandt creek...	30	25	1·5	2·02	36·6	
Jan. 4, 1912	Bristo creek	9	3·1	1·4	..	4·4	
June 9, 1912	Cache creek	10	3·6	0·8	.....	2·8	Above lower diversion.
June 9, 1911..	" ..	...		..	.....	1·7	Irrigation ditch on Semlin ranch.
Aug. 3, 1912	*Canyon creek	56	58	3·5	1·80	205	A tributary of upper Columbia river.
July 15, 1912	Cartwright creek	8	5·7	0·6	0·9	3·2	Also called Carbonate creek.
June 26, 1912	Cherry creek	7·5	2·8	0·9		2·5	Below Cornwall's diversion. See also station on Cherry creek.
Oct. 27, 1912.	*Coquitlam river	80·	200	1·6	2·55	322·	Above Coquitlam lake.
June 18, 1912	Colley creek ..	3·5	1·1	2·1		2·4	Tributary of upper Hat creek.
July 12, 1912	"	3·3	1·2	2·6	.....	3·9	
Aug. 1, 1912	"	2·7	0·8	1·3	.....	1·0	
Aug. 20, 1912.	"	2·8	0·8	2·0		1·7	
Oct. 10, 1911	Chehalis river	...	.	.....	1·11	205	
Oct. 17, 1911	"	....	......	...	1·74	526	
Oct. 20, 1911	"	.	......	...	1·56	412	Just below outlet of Chehalis lake. Measurements made by R. G. Swan, B.A. Sc.
Oct. 22, 1911	"	...	......	...	1·41	323	
Oct. 24, 1911	"	...	...	....	1·26	271	
Oct. 26, 1911	"	..	.....		1·18	235	
Oct. 30, 1911	"	..	.....	.....	1·04	183	
Nov. 1, 1911.	"		....	...	0·90	134	
Nov. 3, 1911	"			.	0 86	128	
Nov. 3, 1911	"	73	127	1 1	0·86	133	By C. G. Cline. Ry. Belt Hydrographic Survey.
May 30, 1912.	Dairy creek..	3·0	1·4	0·8		1·1	Beaton's ditch.
May 19, 1912.	Duffy creek	1·1	0·2	0·4	0 4	0·1	
June 24, 1912	Edwards creek.	2·0	1·0	1·3	...	1·3	Irrigation ditch.
June 25, 1911	"	11·0	6·3	0·3		1·8	At Devick's lower diversion.
June 24, 1911.	" ..	2·0	0·3	0·8	....	0·2	Diversion to Sullivan creek.

MISCELLANEOUS DISCHARGE MEASUREMENTS—*Continued.*

Date.	Name of Stream.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.	Remarks.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
July 13, 1911	Eight-mile creek.....	1·5	0·15	1·6	....	0·7	Near Ashcroft, flowing into Thompson river.
June 5, 1912	*Emerald river ...	22	21	2·1	2·01	49·6	
June 26, 1912	"	36	62	3·9	2·92	237	
July 1, 1912..	"	36	45	3·2	2·5	144	
Aug. 5, 1912	"	37	46	3·4	2·58	156	
Aug. 14, 1912	" ...	37	32	3·3	2·31	106	
Oct 2, 1912	" ...	20	19	1·7	1·85	31	
Oct. 8, 1911	Falls creek	4·0	2·1	1·6	0·64	3·4	
June 20, 1911	Guichon creek (Leighton's diversion to Tunkwa lake).	6·5	4·7	0·7	.	3·4	
May 10, 1912.	" " .	4·0	2·6	11·1	..	30·1	At intake — Difference shows loss in 2 miles of ditch.
May 10, 1912.	" " .	6·5	6·4	2·6	.....	16·5	At outlet
Sept. 16, 1912	" " .	4·0	0·9	6·8	.....	6·2	At outlet.
June 26, 1912.	....		.....	....	......	0	Ditch closed.
July 22, 1912	Guichon creek. ...	24	26	1·3	....	31·5	Above diversions to Lower Nicola.
Aug. 12, 1912	" " .	23	24	1·1	....	26·2	Lower Nicola. See station on Guichon creek at mouth to obtain amount of water used by subtracting the discharges.
Oct. 26, 1912	*Gold creek	31	47	2·6	3·70	124	Tributary of Coquitlam river.
June 6, 1911	Graves creek......	4	1·0	2·1	......	2·1	
June 21, 1911	Gordon creek......	3·0	0·4	1·0	......	0·4	
May 24, 1912.	" "	4·0	2·0	1·2	......	2·5	Max. of 6 c. f. s. on May 17, 1912.
June 5, 1912	" "	3·5	0·75	1·2	....	0·9	
June 21, 1912	" "	4·0	1·2	0·7	......	0·8	
July 9, 1912	" " ...		0·4	1·4	....	0·6	
June 1, 1911.	Hat creek (at Hat Creek ranch, lower station).. .	32	30	4·4	2·15	135	Station abandoned 1911.
July 22, 1911	Hat creek (at Hat Creek ranch, lower station).... .	6	2·8	0·3	0·58	0·9	
Sept. 28, 1911	Hat creek (at Hat Creek ranch, lower station) . .	15	9·2	1·6	0·96	11·8	
Sept. 30, 1911	Hat creek (at Hat Creek ranch, lower station...... ...	15	9·1	1·6	0·96	15·3	
Aug. 19, 1912	Hat creek (in Hammond's ditch)....	4	3·1	1·8	....	5·9	Discharge into reservoir.
Aug. 19, 1912	Hat creek (in Hammond's ditch) ..	....	.... . .	....	0·89	7·2	At intake. Difference between this and former shows loss in ditch.
Aug. 20, 1912	Hat creek (in Hammond's ditch ..	4·5	1·8	2·6	....	4·6	At outlet of reservoir in Oregon Jack divide. Shows amount of water flowing down Oregon Jack creek.
May 9, 1911.	Hat creek (at Pocock's)...	18	10	0·9	1·1	9·5	

MISCELLANEOUS DISCHARGE MEASUREMENTS—*Continued.*

Date.	Name of Stream.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.	Remarks.
		Feet.	Sq ft.	Ft.per sec.	Feet.	Sec.-ft.	
May 16, 1911.	Hat creek (at Pocock's)..........	24	15	2·5	1·73	37·4	
July 19, 1911	Hat creek (below King creek)......	12	7·6	0·2	...	1·4	
Oct. 19, 1912.	*Hixon creek.......	18	35	2·0	2·00	71·5	
July 15, 1912	Hogranch creek....	7	3·8	2·7	0·8	10·5	
June 5, 1912	Horse creek......	7	4·4	1·0	0·65	4·4	
June 23, 1912.	" "	8	5·0	2·1	0·90	12·1	
July 9, 1912.	" "	8	5·4	2·4	0·91	12·8	
Sept. 16, 1912	*Incomappleux river	96	570	2·6		1,520·	
Nov. 3, 1911	*Jones creek	59	96	0·51	0·55	51·8	Gaugings of Jones creek have been taken regularly by Messrs Anderson and Warden, C.E., during 1911 and 1912.
Sept. 18, 1912	" "	60	104	0·83	0·90	87·1	
June 4, 1912	Kicking Horse river (at Palliser)	110	310	3·0	2·1	920	
June 27, 1912	Kicking Horse river (at Palliser)....	150	840	7·2	5·77	6070·	
Aug. 15, 1912	Kicking Horse river (at Palliser)	125	410	5·3	3·42	2140	
June 18, 1912	King creek.......	2·5	0·6	0·8	...	0·4	
July 11, 1912	"	3·2	0·9	1·2	....	1·1	
Aug. 1, 1912.	"	2·5	0·5	0·5	......	0·3	
June 21, 1911	Lane Creek	7·0	3·5	0·9	0·80	3·1	
Aug. 20, 1911	" "	1·0	0·2	0·4	0·27	0·1	
Oct. 7, 1911	" "	1·8	0·4	0·5	0·28	0·2	
May 24, 1912.	" "	9·5	6·3	3·0	1·2	19·3	
June 5, 1912..	" "	2·0	0·6	12·6	....	7·6	
July 9, 1912..	" "	2·5	1·5	2·6	0·8	3·9	
June 13, 1912.	Lloyd creek........	5·	3·8	1·0	1·1	3·9	
Aug. 4, 1912..	" "	6·	2·9	0·8	0·92	2·4	
Aug. 23, 1912	Louis creek	38	47	1·4	....	68·0	Above Armour's diversion.
June 5, 1911	Maiden creek.....	4·0	2·0	3·0	....	6·0	
June 6, 1911...	" "	2·5	0·8	1·7	....	1·3	
July 15, 1911.	" " ..	2·0	0·7	2·0	....	1·4	
July 15, 1911.	" " ...	3·0	2·7	1·0	....	2·7	
Sept. 28, 1911	" "	5·0	3·2	0·6	....	1·9	
Aug. 2, 1912.	" "	5·3	4·6	1·0	....	4·5	
Aug. 28, 1912	" " ..	6·5	4·7	0·9	....	4·4	
Oct. 31, 1912.	*Mesliloet river... (upper station)	70	120	1·6	2·26	188·	
Aug. 21, 1912	McGillivray creek...	7·5	7·0	0·8	....	5·5	A tributary of Louis creek.
July 15, 1912.	McKeeman creek..	12	6·	0·75	......	4·5	
May 20, 1911.	Monte creek............	....	....	....	....	19·0	Below Bostock diversion.
May 25. 1911	" "	....	....	....	....	41·5	Above diversion to Summit lake.
Sept. 15, 1911	Murray creek.......	....	....	....	....	9·8	
Oct. 24, 1911	" "	....	....	....	....	13·5	
July 23, 1912.	*Nahatlatch river... (lower station)	80·	432	4·4	3·75	1,920·	
Nov. 28, 1912	*Nahatlatch river... (lower station)	60	352	2·5	2·20	891·	
[illegible] 15, 1912.	Nelson creek......	5	2·6	0·8	2·6	2·0	A tributary of upper Columbia river.
Sept. 23, 1911	Nikaia creek	5·8	4·0	1·1	....	4·4	
June 1, 1912..	" "	6·0	5·0	1·6	....	8·1	
July 27, 1912.	" "	3·5	1·0	0·7	....	0·6	
Oct. 20, 1912.	*Norton creek......	9	12	0·6	2·53	7·6	
Oct. 5, 1911	Palmers creek......	4·5	1·6	1·1	1·0	1·7	
May 19, 1912.	" "	14	12	3·1	2·0	36·3	
June 14, 1912.	" "	9	9	1·6	....	14·6	
June 13, 1912.	*Paul creek.........	9	9	1·1	0·95	9·5	Below Pinantan lake.
Aug. 4, 1912..	" "	7	1·9	0·8	0·65	1·5	" "

MISCELLANEOUS DISCHARGE MEASUREMENTS—*Continued.*

Date.	Name of Stream.	Width.	Area of section.	Mean velocity.	Gauge height.	Discharge.	Remarks.
		Feet.	Sq. ft.	Ft. per sec.	Feet.	Sec.-ft.	
Mar. 26, 1912	Peterson creek......	5·7	2·4	1·1	0·2	2·7	Victoria St., Kamloops.
Mar. 26, 1912	" "	6·5	2·9	2·5	0·3	7·3	
Mar. 26, 1912	" "	16	7·1	4·6	0·63	32·4	
Mar. 26, 1912	" "	12·4	7·8	6·7	0·8	52·3	
......	......				....	80·	Maximum at 5 p.m.
May 11, 1912.	Quenville creek. ..	15	14	3·5	1·0	50·2	
May 22, 1912.	" "	12	12	1·7	0·2	19·5	
June 10, 1912.	" "	4·5	2·6	1·2	−1·1	3·1	
July 13, 1912.	" "		4·0	0·8	....	3·2	
May 26, 1911.	Robbins creek	7·0	2·7	0 7	.....	1·8	Above Albert Duck's meadow.
Nov. 3, 1912	*Rushton creek......	32	51	1·2	2·18	61·	
Aug. 24, 1911	Salmon river...... ..	21	10·6	0·4	....	4·6	Half mile above Woods ranch.
Sept. 16, 1912	Salmon creek ..	38	32	1·8	....	58·	Near Beaton, upper Arrow lake.
Aug. 28, 1912	Scottie Creek......	2·1	1·1	2·0		2·1	Hunters' diversion.
Aug. 22, 1911	Silver creek	8	3·6	1 0	0·73	3·5	Tributary of Salmon river near Salmon Arm
Aug. 9, 1912..	*Silver Pitt creek...	65	104	2·4	1·5	250	
Sept. 16, 1911	Skuhun creek.... .	11	10	0·6		5·5	
May 30, 1911.	South Thompson river at Kamloops	500	9,700	2·2	.	21,900	
May 30, 1911.	South Thompson river at Kamloops	500	9,600	2·2	..	21,100	
Nov. 2, 1911	Statlu creek.. ..	20	131	0·3	1 46	40·	
Oct. 14, 1911	Stave river. .	250	831	2·4	1·15	2,020	
Oct. 15, 1911.	" " ..	250	1,043	3·5	2·30	3,620	
Oct. 19, 1911.	" "	250	1,195	4·1	2·80	4,860	
Oct. 17, 1911.	" "				2·50	3,655	Weir method.
Oct. 16, 1911	" " .				2·30	3,470	Slope method.
Nov. 22, 1911	" " .	205	4,570	2·1	4·50	9,480	
May 9, 1912..	Three-mile creek....	15·5	16·6	2·5	.	41·5	Below Leighton's ranch on Kamloops-Savona road.
May 30, 1912.	" " .	7	7	2·14	..	14·9	Below Leighton's ranch on Kamloops-Savona road.
July 26, 1912.	" "	9	4·5	1·34	.	6·1	Below Leighton's ranch on Kamloops-Savona road.
May 10, 1912.	" " ..	12	4·4	1·4	.	6·1	West branch (including
May 24, 1912.	" " ...	6	2·8	0·7	.	2·0	water from Leighton's
July 2, 1912	" " .	5	2·8	0·6	..	1·6	ditch from Guichon
July 27, 1912	" "	6	1 6	0·75		1·2	creek.)
July 27, 1912	" " ..			.		0·6	East branch.
Sept. 11, 1911	Tranquille river...	2·0	0 5	1·3		0·7	Irrigation ditch.
July 4, 1911	" " .	2·5	1·2	1·6		2·0	" "
Sept. 10, 1912	" " ..	26	21	1·6		33·8	At foot of canyon.
June, 21 1911	Twaal creek.... ..	7·5	6·9	0·8	.	5·8	Above Indians' diversion.
May 20, 1912.	" " ..	6·5	1·5	2·1	0·62	3·2	Above Moren's diversion
June 27, 1912	" " .	4·0	1·4	2·8		3·9	" " "
July 19, 1912	" "	1·3	1·5	3·1	0 45	4·6	
Aug. 9, 191[illegible]	" "	7·3	2·1	2 1	0 42	4·5	
July 15, 19[illegible]	Twenty-eight Mile creek........ ..	3·5	1·6	0·4	3·5	0·[illegible]	Tributary of upper Columbia river.
Oct. 26, 1912	*Viola creek......	51	58	4·5	1·80	258·	Tributary of Coquitlam lake.
June 5, 1912..	Washout creek....	4	2·1	0·5	0·79	1·1	
June 23, 1912	" "	5	2·8	0 6	0·83	1·8	
July 9, 1912.	" "	11	1 2	1 0	1 01	1 1	
July 15, 1912.	Warmspring creek	7	1·8	1·1		2·0	
Oct. 6, 1911..	White creek....	9	4·8	0·4	.	1·8	
June 5, 1912..	Yoho river.... ..	53	50	2·6	...	127	See also river station.
Oct. 20, 1912.	*Young creek... .	11	11	1·1	2·0	11·4	Tributary of Meslilloet river.

PART IV

HYDROGRAPHIC GAZETTEER

OF

LAKES, RIVERS, CREEKS AND OTHER SOURCES OF WATER SUPPLY IN AND ADJOINING THE RAILWAY BELT OF BRITISH COLUMBIA.

HYDROGRAPHIC GAZETTEER OF LAKES, RIVERS, CREEKS AND OTHER SOURCES OF WATER SUPPLY IN AND ADJOINING THE RAILWAY BELT OF BRITISH COLUMBIA.

This list is not guaranteed to be complete, but is compiled from all available sources of information, Government and private maps, lists of water records and local knowledge. Most of the names are those adopted by the Geographic Board of Canada; others are merely local names, and an attempt has been made to locate and identify the features affixing the most suitable name for future permanent reference. There are also a number of local names of unidentified streams from the lists of water records, which have not been included in this list.

Adams River.—An important river flowing from Adams lake into Shuswap lake in township 22-12-6, near Chase, B.C. The river is only about 7 miles long, and falls about 190 feet. Important timber interests, and one of the best undeveloped water-powers in the interior of British Columbia. *See* hydrographic data of river station on Adams river. (South Thompson drainage.)

Adams Lake.—A lake about 40 miles long and with a superficial area of 60 square miles. Empties into Adams river. Important timber interests. Good reservoir for power purposes. (Adams-South Thompson drainage.)

Agate Creek.—A small tributary of Nicola river from the west in the 'Dry Belt,' in township 15-23-6. Might be used for irrigation, but there is little development in the vicinity. (Nicola-Thompson drainage.)

Agnes Creek.—A small tributary of Paul creek in township 20-15-6, in the 'Dry Belt.' Water not used. Probably same creek as Lloyd creek. (Paul-North Thompson drainage.)

Aikens Creek.—Local name for small unidentified irrigation stream.

Akolkolex River.—(Sometimes called Isaac creek). Has its source in the Selkirks in township 23-28-5, is 18 miles long and discharges into Columbia river from the east, about 16 miles below Revelstoke. The drainage area is 65 square miles. The water is used for logging, and there are good water-power possibilities.

On September 13, 1912, the discharge was 665 c.f.s. The estimated maximum flow in the middle of the summer is about 2,000 c.f.s. The estimated minimum flow is about 50 c.f.s. during the severe winter.

About 2 miles from the mouth there is a fall of 335 feet; a total head of nearly 400 feet could be obtained, the rocky canyon being only from 30 feet to 40 feet wide. There is no good natural storage available. This waterfall is worthy of future investigation. (Columbia drainage.)

Albert Canyon Springs.—Hot springs about half mile south of Albert Canyon railway station. (Illecillewaet-Columbia drainage.)

Albert Creek.—A mountain stream flowing into Illecillewaet river from the south, in township 25-28-5, near Albert Canyon railway station. No important interests (Illecillewaet-Columbia drainage.)

Alder Creek.—A small mountain stream flowing into Beaver river from the west, in township 29-25-5. Water not used. (Beaver river-Columbia drainage.)

Alexander Creek.—Probably a small unimportant tributary of Jamieson creek, in Tranquille plateau, 20 miles north of Kamloops.

Alkali Creek.—A small irrigation tributary of Cherry creek in township 19-19-6. *See* miscellaneous measurements thereon.

Alkali Creek.—A small tributary of South Thompson river from the north, in township 19-15-6. Generally dry. (South Thompson drainage.)

Allen Creek.—A small tributary of Bonaparte river from the west, near the north limit of the Railway Belt. Irrigation only. (Bonaparte-Thompson drainage.)

American Creek.—A small tributary of Fraser river from the west, in township 5-26-6, 4 miles north of Hope. No important interests. (Fraser drainage.)

Amiskwi River.—A tributary of Kicking Horse river from the north. It rises in the main Rockies at Amiskwi pass (some 17 miles northwest of Field) at an elevation of about 6,000 feet. It flows for about 10 miles in a general southerly direction and discharges into Kicking Horse river 3 miles west of Field. It is a rapid mountain stream about 40 feet wide, and varies in depth from 2 to 5 feet. Its maximum flow occurs in June, from the melting mountain snow and glaciers, and is estimated at 900 c.f.s. The estimated minimum flow is 20 c.f.s. in February. The winters are cold and severe (−40 F.). The annual precipitation is about 35 to 40 inches, of which 60 per cent is snow. The principal interest is lumbering. Power possibilities are small. The drainage area is 80 square miles. (Kicking Horse-Upper Columbia drainage.)

Anderson Creek.—A small stream, in township 19, E.C.M., flowing from the west into Sumas lake. No important interests. (Sumas-Fraser drainage.)

Anderson Creek.—A small creek in the Dry Belt, in township 20-26-6, flowing from the west into Hat creek. (Hat creek-Bonaparte-Thompson drainage.)

Andersen Creek.—A small tributary of Campbell creek, in township 18-17-6, in the Dry Belt. (Campbell creek-South Thompson drainage.)

Anderson River.—A tributary of Fraser river from the east, in township 10-26-6. Possible small power development. For hydrographic data see river station on Anderson river. (Fraser drainage.)

Andrew Lake.—A small lake at the head-waters of Cherry creek, in township 19-19-6. Suitable for a small reservoir for irrigation purposes. (Cherry creek-Thompson drainage.)

Anstey Arm.—The most northeasterly arm of Shuswap lake, in townships 24-7-6 and 25-7-6.

Anstey River.—Flows into the north end of Anstey arm of Shuswap lake, in township 25-7-6. (Shuswap lake-South Thompson drainage.)

Antler Lake.—A very small lake on the plateau west of Mamit lake, in township 16-21-6. No important interests.

Armstrong Creek.—Local name of unidentified creek in the Revelstoke district.

Arrow Lake.—A broadening of Columbia river, some 30 miles south of Revelstoke. Outside the Railway Belt. (Columbia drainage.)

Ashton Creek.—A small tributary of Shuswap river from the north, in township 18-8-6. No important interests. (Shuswap-South Thompson drainage.)

Asulkan Creek.—A small glacial stream tributary to Illecillewaet river, at Glacier, B.C. (Illecillewaet-Columbia drainage.)

Atchalitch Creek.—A small tributary of Fraser river from the south, near Sumas, in township 23, E.C.M. (Fraser drainage.)

Bachelor Creek.—A mountain torrent, tributary to Gold creek from the south, in township 30-27-5. (Gold creek-Columbia drainage.)

Badger Creek.—Local name of a small unidentified irrigation stream in the Dry Belt.

Badlands Lake. Local name of a small unidentified lake, about 27 miles east of Kamloops.

Bain Creek. A small tributary of Incomappleux river, in township 25-26-5. Mining interests only. (Incomappleux-Columbia drainage.)

Baines Creek.—A small irrigation stream tributary to North Thompson river from the west. Probably outside the Railway Belt.

Baird Creek. A small mountain stream flowing into North Fork of Spillimacheen river from the east, in township 26-24-5. No important interests or users. (Spillimacheen-Upper Columbia drainage.)

Barnes Lake.—A small lake tributary to Barnes creek in township 20-24-6. (Thompson drainage.)

Barnes Creek.—A small but contentious irrigation stream flowing into Thompson river from the southeast, about 4 miles east of Ashcroft in township 20-24-6. For hydrographic data see the river station on Barnes creek. (Thompson drainage.)

Barricade Creek. A small tributary of Deadman river from the west in township 23-22-6. The water is used for irrigation purposes. (Deadman-Thompson drainage.)

Battle Creek. A glacial stream tributary to Incomappleux river from the east, in township 24-26-5. (Incomappleux-Columbia drainage.)

Bear Creek.—A small tributary of Harrison lake, in township 6-28-6. (Harrison-Fraser drainage.)

Bear Creek. A mountain stream rising near Rogers pass and flowing into Beaver river from the east, in township 27-25-5. The C.P.R. has several water records for railway purposes. (Beaver-Columbia drainage.)

Bear Creek. A tributary of Adams river from the west in township 22-12-6; it is 8 miles long, 10 to 15 feet wide and has a mean summer discharge of 25 c.f.s. Its drainage area is 25 square miles. Timber interests are important and the Adams River Lumber Company proposes to divert the waters (20 c.f.s.) from the creek for fluming logs to Little Shuswap lake. (Adams-South Thompson drainage.)

Beard Creek.—A small irrigation stream, tributary to Upper Columbia river from the east, in township 24-19-5. On July 15, 1912, the discharge was 1·3 c.f.s. which is about the mean summer flow. (Upper Columbia drainage.)

Beaver Lake. A small lake on the plateau north of Kamloops lake, six miles from Battle Bluff.

Beaver River. Rises in Duncan pass, at an elevation of 4,600 feet, and flows northerly for 35 miles, emptying into Columbia river about 1 mile west of Beavermouth railway station. There is no agriculture in the valley, but some good timber is still uncut. There are no pronounced falls or rapids in the upper part of the river, but near the mouth there is the Natural Arch (or Gateway) close to the railway. There is a fall in the river of about 80 feet in a distance of 5,000 feet, the river being only from 20 to 40 feet wide, with rocky banks. At the head of the rapids the C.P.R. rail is only 15 feet above the high-water mark, and at the foot it is 25 feet above high water. A dam at the head of the rapids would give excellent pondage.

Any development is restricted by the proximity of the present grade of the railway.

The precipitation, in this part of the Selkirks, ranges from 50 inches to 70 inches, mostly snowfall. The winter conditions are severe. In the summer the days are hot and the nights are cool. The estimated maximum flow, in June, July or August, is 3,000 [illegible] The estimated minimum flow during the winter is about 50 c.f.s.

The drainage area of the Beaver river is 400 [illegible] miles. (Columbia drainage.)

Beaver Creek. A small tributary of the Fr[illegible] river in township 11, E.C.M. Unimportant stream. (Fraser drainage.)

Beaverfoot River.—Rises in a low pass near the source of the Kootenay river, about 20 miles south of the C.P.R., and, flowing northerly through a valley nearly a mile wide, empties into the Kicking Horse river, near Leanchoil station and just above the Wapta falls. The Beaverfoot river is navigable for about 18 miles. Ice river is its largest tributary.

The drainage area of the Beaverfoot river is [illegible] square miles. The annual precipitation is probably from 30 inches to 35 inches, with heavy snowfall on the mountains. The winter conditions are severe, and the summers hot.

The estimated maximum discharge in June [illegible] c.f.s., and the minimum discharge in the winter is about 25 c.f.s. (Kicking Horse-Columbia drainage.)

Beavertail River.—Now called Amiskwi river.

Bedwell Bay.—Part of the North arm of Burrard inlet, a tidal bay of the Pacific.

Belknap Creek.—A small tributary of Hixon creek (a tributary of Mesliloet river from the east) in township 6-7-7. Timber and small industrial power. The discharge on October 21, 1912, was 34 c.f.s. (Mesliloet drainage.)

Belknap Lake.—A small lake at the source of Belknap creek in township 6-7-7; suitable for storage. (Mesliloet drainage.)

Benedict Creek.—A tributary of Bachelor creek from the south, in township 30-27-5; it is a rapid mountain stream of little or no importance. (Bachelor-Gold-Columbia drainage.)

Bertrand Creek.—A small unimportant stream in township 13, E.C.M. (Fraser drainage.)

Big Creek.—A small stream flowing southerly into the northeast arm, Arrow lakes; small power development possible. (Columbia drainage.)

Big Eddy Creek.—A small stream in township 26-2-6, near Revelstoke. (Columbia drainage.)

Big Fish Lake.—A lake about one mile long, being the headwaters of Greenstone creek. Elevation, 4,800 feet; of importance in connection with storage for irrigation purposes. (Greenstone-Meadow-Guichon-Nicola drainage.)

Big Gulch.—Probably Indian Garden creek, or a branch of it; in township 20-21-6; irrigation. (Thompson drainage.)

Big Lake.—Now called Tunkwa lake.

Blackwater Creek.—A tributary of Bluewater creek, 3 miles from its mouth, in township 30-24-5; the creek is sluggish, 10 miles long, 15 to 20 feet wide and 2 feet deep. (Bluewater-Columbia drainage.)

Blackwater Lake.—A small lake, 1 mile long, near the head of Blackwater creek, in township 30-25-5. (Blackwater-Bluewater-Columbia drainage.)

Blaeberry River.—A large tributary of Columbia river from the northeast, 10 miles northwest of Golden. For complete description and hydrographic data see River Station on Blaeberry river. (Columbia drainage.)

Blair Creek.—A small tributary of Bolean creek in township 18-12-6. (Bolean-Salmon-Shuswap-Thompson drainage.)

Blue-Earth Creek.—A small trbutary of Hat creek in township 19-26-6. It has a maximum flow of about 4 c.f.s. in the month of May; (Hat Creek-Bonaparte-Thompson drainage.)

Blue-Earth Lake.—Is situated at the head of Blue-earth creek in the southeast corner of township 19-26-6. These are really two small lakes, with a difference in elevation of 5·7 feet. The area of the two lakes at their present water level is 4[illegible] acres, but at the 20-foot contour (*i.e.*, at the height of the old broken dam at the outlet of the lake), 74 acres. The capacity of the reservoir at the 20-foot contour is 1,10[illegible] acre-feet. Twaal creek divide at the easterly end of Blue-earth lake is 26 feet above the lake. The drainage area of Blue-earth lake is about 7 square miles. (Hat-Bonaparte Thompson drainage.)

Bluewater Creek.—A tributary of Columbia river from the north, 3 miles west of Donald in township 29-23-5; about 10 miles long, 150 feet wide and from 2 to 3 feet deep.

Bole Creek.—A small unimportant stream in the New Westminster district. (Fraser drainage.)

Bolean Creek.—(Sometimes called Six-mile creek), a tributary of Salmon river from the north in township 18-12-6, about 10 miles east of Grand Prairie. Bolean creek is just at the easterly limit of the Dry Belt. For complete hydrographic data see River Station on Bolean creek. (Salmon-Shuswap drainage.)

Bonaparate River.—A large tributary of the Thompson river from the north at Ashcroft in township 20-21-6; important irrigation and power interests. For complete hydrographic data see River Station on Bonaparte river. (Thompson drainage.)

Boston Bar Creek.—A small tributary of Coquihalla river in township 5-25-6. (Coquihalla-Fraser drainage.)

Botanie Creek.—A contentious irrigation stream flowing into Thompson river from the north in township 15-26-6, about 3 miles east of Lytton. For hydrographic data see River Station on Botanie creek. (Thompson drainage.)

Botanie Lake.—A lake of about 60 acres at the head of Botanie creek in Botanie Indian Reserve No. 15; suitable for reservoir for irrigation. (Botanie-Thompson drainage.)

Boulder Creek.—A small tributary of Chehalis river from the west in township 4-30-6. (Chehalis-Harrison-Fraser drainage.)

Boulder Creek.—A tributary of Jones creek near Jones lake in township 3-27-6; of interest in connection with the proposed power dvelopment of Jones lake. Detailed hydrographic data have been gathered by Messrs. Anderson and Warden, civil engineers, Vancouver, and check measurements have been made by the Railway Belt Hydrographic Survey. (Jones creek-Fraser drainage.)

Boulder creek.—A small tributary of Kicking Horse river from the east, near Emerald railway station, in township 29-19-5. (Kicking Horse-Columbia drainage.)

Boyd Creek.—A small tributary of Incomappleux river from the east, in township 22-26-5; timber interests and possibly small industrial power. (Incomappleux-Columbia drainage.)

Brandt Creek.—A small tributary of Mesliloet riv[illegible] the east in township 6-7-7. Timber interests and small industrial power. D[illegible]rge on October 19, 1912, was 37 c.f.s. (Mesliloet drainage.)

Brash Creek.—(Sometimes called Elk creek.) A small tributary of Shuswap river from the north in township 18-8-6, 5 miles east of Enderby. (Shuswap-Thompson drainage.)

Brewery Creek.—A small stream flowing into Columbia river at Revelstoke.

Bridal Veil Falls.—Near Pitt lake.

Bridge Creek.—A small tributary of the Illecillewaet from the north near Revelstoke; city of Revelstoke water supply. (Illecillewaet-Columbia drainage.)

Brigade Lake.—A small lake in section 32, township 17-17-6, flowing into Campbell creek. (Campbell-South Thompson drainage.)

Bristo Creek.—A small stream flowing into Sumas lake from the west in section 27, township 19, E.C.M.; small industrial power and domestic uses. On January 4, 1912, the discharge was 4·3 c.f.s. (Sumas-Fraser drainage.)

Brousseau Creek and Lake.—A small tributary of Barricade creek in township 23-23-6. (Barricade-Deadman-Thompson drainage.)

Bryant Creek.—A tributary of Beaver river near Cutbank, probably either Cedar creek or Surprise creek. (Beaver-Columbia drainage.)

Buce Creek.—A small irrigation stream flowing into Buce lake in township 19-15-6.

Buce Lake.—A small lake in section 28, township 19-15-6, used for a storage reservoir for irrigation purposes; a greater portion of the water being diverted from Robbins Creek via Buce creek. (South Thompson drainage.)

Bugaboo River.—Is a tributary of the Columbia river from the west, about 40 miles north of Golden, B.C., and about 3 miles above the Spillimacheen river. It has its source in the Selkirk mountains at an elevation of from 6,000 feet to 9,000 feet. The drainage area is about 190 square miles.

Bugaboo river is a mountain torrent. At the highway bridge, about one mile from its mouth, it is about 60 feet wide at high water, and has a mean velocity of 6 feet per second. At low water it is 23 feet wide, and has a mean velocity of 2 feet per second.

At present, lumbering is the only interest on the river. Industrial power is a possibility. Two miles from the mouth, a canyon begins. This canyon is 1 mile long, and in that distance there is a fall of 220 feet (aneroid measurements). At the head of the canyon there is a fall of 60 feet.

For hydrographic data see River Station on Bugaboo river. (Drainage-Upper Columbia.)

Bullard Creek.—A small tributary of the Incomappleux river from the west near the south boundary of township 23-26-5. (Incomappleux-Columbia drainage.)

Bullet Creek.—A small tributary of Fraser river from the west, about 15 miles north of Lytton. (Fraser drainage.)

Buntzen Lake.—A small lake in township 39, W.C.M., used for storage purposes in connection with power development by the Vancouver Power Co. Area is 500 acres. Drainage area is 7 square miles. Elevation, 400 feet. Complete hydrographic data have been gathered by that company. (Burrard Inlet drainage.)

Burrard Inlet.—An arm of the Pacific, near Vancouver.

Bush Creek.—A tributary of Adams lake from the west, in township 23-13-6. (Adams-South Thompson drainage.)

Bush Lake.—Two small lakes in township 32-26-5 in the flat near the mouth of Bush river. (Columbia drainage.)

Bush River.—A large tributary of Columbia river entering from the east in township 32-26-5. Bush river is about 20 miles long to its forks. It is navigable almost to the forks, where there is a fall 6 feet high. The north fork is navigable for several miles, but the south fork has numerous falls and rapids. Bush river, at its mouth, is about 150 feet wide and from 3 to 5 feet deep. It has an estimated maximum discharge in July of 5,000 to 7,000 c.f.s., and a minimum discharge during severe winters of 60 c.f.s.

The precipitation is about 40 inches to 60 inches, mostly snowfall. The river is frozen for four months in the year. (Columbia drainage.)

Butter Creek.—A small stream in section 8, township 10-29-6.

Cabin Creek.—A small creek flowing into Columbia river from the west, in township 27-22-5, just below Golden. (Columbia drainage.)

Cache Creek.—A tributary of Bonaparte river from the east, in township 21-24-6; an important irrigation stream. For hydrographic data see River Station on Cache creek. (Bonaparte-Thompson drainage.)

Cahilty Creek.—A tributary of Louis creek from the east, in township 23-15-6; some water used for irrigation; small industrial power possible. For hydrographic data see River Station on Cahilty creek. (Louis-North Thompson drainage.)

Callihan Creek.—Now called Chatter creek.

Calling Lake.—A small lake (elevation 4,920) in township 17-23-6 at the head of Inkikuh creek. (Fraser drainage.)

Campbell Creek.—A contentious irrigation stream emptying into South Thompson river from the south, 10 miles east of Kamloops. For hydrographic data see River Station on Campbell creek. (South Thompson drainage.)

Campbell Lake.—At the head of the east Fork of Campbell creek, in township 18-16-6; a storage reservoir for irrigation purposes. (Campbell-South Thompson drainage.)

Campbell River.—A small stream flowing into Semiamu bay, in township 1, W. C.M.

Camp Lake.—A small lake on the north side of the Thompson river, 27 miles east of Kamloops. (South Thompson drainage.)

Canoe Creek.—A tributary of Salmon Arm from the south, in township 21-9-6; municipal water supply for the city of Salmon Arm. For hydrographic data see River Station on Canoe creek. (Shuswap Lake-South Thompson drainage.)

Canyon Creek.—Is a mountain stream rising in the Dogtooth range of the Selkirks and flowing into the Columbia river from the west, 7 miles south of Golden. The creek is about 15 miles long and from 15 feet to 50 feet wide. About 1 mile from the mouth there is a canyon 4 miles long in which the creek falls 850 feet (measured by aneroid). At the foot of the canyon the creek is 25 feet wide. The Columbia River Lumber Co. has a small dam at the foot of the canyon. Small industrial power could be developed at great expense. There are some important timber interests up the creek. Drainage area is 62 square miles. The precipitation varies from 14 inches at the mouth to 40 inches in the Selkirks. On August 3, 1912, the discharge was 205 c.f.s. The estimated maximum discharge early in July is 500 c.f.s. The estimated minimum flow during the severe winter is 15 c.f.s. (Upper Columbia drainage.)

Canyon Creek.—A small tributary of Jordan river in township 24-2-6, near Revelstoke. (Jordan-Columbia drainage.)

Canyon Creek.—A small tributary of Hefferly lake, in township 22-16-6. (Hefferly-North Thompson drainage.)

Carbonate Creek.—Now called Cartwright creek.

Cariboo Creek.—A small mountain stream flowing into Illecillewaet river from the north, in township 26-27-5. (Illecillewaet-Columbia drainage.)

Carnes Creek.—A tributary of Columbia river from the east at the north limit of the Railway Belt north of Revelstoke; timber, mining and small power. (Columbia drainage.)

Cartwright Creek.—A small tributary of Columbia river from the east, 17 miles south of Golden, in township 25-20-5. Also called Carbonate creek. Water is used for irrigation. On July 15, 1912, the discharge was 3 c.f.s., which is about the mean summer flow. (Upper Columbia drainage.)

Cascade Bay.—An arm of Harrison lake in township 5-28-6. (Harrison-Fraser drainage.)

Cascade Creek.—A small tributary of Stave river from the east in township 4-3-7. (Stave-Fraser drainage.)

Castle Creek.—A small stream in township 22-11-6 flowing into Shuswap lake from the south, near Notch hill. (Shuswap lake-South Thompson drainage.)

Cataract Creek.—A small mountain stream tributary to Kicking Horse river. from the south, in township 28-17-5. (Kicking Horse-Columbia drainage.)

Cathedral Creek.—A small tributary of the Kicking Horse from the south, 5 miles east of Field; small industrial power developed by Mount Stephen Mining Syndicate. (Kicking Horse-Columbia drainage.)

Cattle Creek.—A small tributary of Hat creek from the south in township 22-26-6. (Hat-Bonaparte-Thompson drainage.)

Cedar Creek.—A small mountain stream flowing into Beaver river from the west, in township 28-25-5.

Cedar Creek.—A small tributary of Upper Columbia river from the east at the south limit of the Railway Belt, in township 23-18-5.

Cedar Creek.—A small stream near Notch hill, in township 22-11-6. (Shuswap lake-South Thompson drainage.)

Celista Creek.—A tributary of Seymour Arm of Shuswap lake from the north in township 26-8-6. (Shuswap lake-South Thompson drainage.)

Charcoal Creek.—A tributary of Chase creek from the east, in township 19-12-6. (Chase-South Thompson drainage.)

Chartrand Creek.—A small irrigation stream flowing into Guichon creek from the east in township 18-21-6. For hydrographic data see River Station on Chartrand creek. (Guichon-Nicola-Thompson drainage.)

Chase Creek.—A tributary of South Thompson river from the south in township 21-13-6. Irrigation, power and municipal water supply. For hydrographic data see River Station on Chase creek. (South Thompson drainage.)

Chatter Creek.—A small tributary of Bush river from the north, in township 32-25-5. Sometimes called Callahan creek. (Bush-Columbia drainage.)

Chawuthen Creek.—A very small tributary of Fraser river from the south, in township 5-27-6. (Fraser drainage.)

Cheam Lake.—A small lake on the south side of Fraser river, in township 3-28-6.

Chehalis Lake.—An important broadening of Chehalis river, in township 5-1-7 and 6-1-7. Good reservoir.

Chehalis River.—A tributary of Harrison river from the north, in township 4-30-6; important timber and power interests. For hydrographic data see River Station on Chehalis river. Hydrographic investigations by the Vancouver Power Co. have also been made. (Harrison-Fraser drainage.)

Cherry Creek.—An important and contentious irrigation stream flowing into Kamloops lake from the south, in township 20-20-6. For hydrographic data see River Station on Cherry creek. (Thompson drainage.)

Chilliwack lake.—A large lake about 25 miles long at the head of Chilliwack river, in township 1-26-6.

Chilliwack River.—A large tributary of Sumas lake, in township 22, E.C.M. The river now enters Sumas lake via the channel of Vedder creek, having been diverted some years ago from its original bed to the Fraser via the old Luckakuck channel. The control of this river is important in connection with the large Sumas Dyking Project; timber interests and possible power. For hydrographic data see River Station on Chilliwack river. (Sumas-Fraser drainage.)

Christian Creek.—Small tributary of Louis creek from the west in township 22-15-6. (Louis-North Thompson drainage.)

Chuloewaku Creek.—A very small tributary of Fraser river from the west above Lytton, in township 16-27-6. (Fraser drainage.)

Chum Creek.—A small stream flowing into South Thompson river from the south, in township 22-12-6. (South Thompson drainage.)

Chum Lake.—A small lake at the head of Chum creek, in township 21-12-6. (Chum-South Thompson drainage.)

Chuwhels Lake.—A small lake at the head of Cherry creek, in township 18-19-6; storage reservoir for irrigation purposes. (Cherry-Thompson drainage.)

Cinquefoil Creek.—A small tributary of Rough creek in township 18-28-6. Outside the Railway Belt. (Rough-Fraser drainage.)

Cisco Creek.—A small tributary of Fraser river, in township 14-27-6. (Fraser drainage.)

Clanwilliam Lake.—A small lake in Eagle pass, emptying into Eagle river, in township 23-3-6. (Eagle-Shuswap lake-Thompson drainage.)

Clear Creek.—A tributary of Silver creek, in township 8-29-6. (Silver-Harrison lake-Fraser drainage.)

Cold Creek.—A small tributary of Paul Creek in Kamloops Indian Reserve. (Paul-North Thompson drainage.)

Coldspring Creek.—A small tributary of Thompson river from the east, in township 18-24-6.

Coldwater River.—A tributary of Nicola river from the south at Merritt. Source of river only in Railway belt. (Nicola-Thompson drainage.) Maximum flow for 1912 (estimated), 1,800 second-feet on May 21. Minimum flow for 1912 (estimated), 25 second-feet on September 30.

Colley Creek.—A small tributary of Hat creek from the west, in township 19-26-6; irrigation. See miscellaneous measurements on Colley creek. (Hat-Bonaparte-Thompson drainage.)

Columbia River.—One of the largest and best known rivers in British Columbia. *Vide* complete description of Columbia river.

Comedy Creek.—A tributary of Six-mile creek, in township 30-26-5. (Six-mile-Beaver-Columbia drainage.)

Cooke Creek.—A tributary of Shuswap river from the north, in township 19-6-6. (Shuswap-Thompson drainage.)

Copper Creek.—A tributary of Kamloops lake from the north, in township 21-20-6. Used for irrigation. (Thompson drainage.)

Copper Creek.—A tributary of Spillimacheen, Upper Columbia drainage.

Coquihalla River.—A tributary of Fraser river from the east at Hope, in township 5-26-6. Possible power developments. For hydrographic data see River Station on Coquihalla river. (Fraser drainage.)

Coquitlam Lake.—An important lake used for storage reservoir by the Vancouver Power Co., the water being diverted by a tunnel (maximum capacity, 1,350 c.f.s.) 2 miles long, to Buntzen lake. Lake also used by city of New Westminster for civic water supply. Hydraulic earth-fill dam 60 feet high constructed by the Vancouver Power Co. Lake is 7 miles long; area is 2,330 acres. The drainage area is 105 square miles. Precipitation is about 150 inches per annum.

Coquitlam River.—A tributary of Fraser river, in township 38, W.C.M. (Fraser drainage.)

Cornwall Creek.—A small irrigation stream flowing into Thompson river from the west in township 20-24-6. For hydrographic data see River Station on Cornwall creek.

Cornwall Lake.—A small lake on Cornwall creek, in township 21-25-6.

Cornwall Lake.—A small storage lake near the headwaters of Cherry creek, in township 19-19-6.

Cottonwood Lake.—A broadening in Maria slough (of Fraser river) in township 3-28-6 and 4-28-6. (Fraser drainage.)

Cougar Lake.—A tiny lake on the plateau west of Guichon creek, in township 16-21-6. (Guichon-Nicola drainage.)

Cougar Creek.—A small mountain stream flowing into Illecillewaet river from the north in township 26-26-5. The creek flows through the Nakimu Caves. (Illecillewaet-Columbia drainage.)

Cowan Creek.—Local name of small stream flowing into the Illecillewaet from the north, in township 24-1-6. City of Revelstoke water supply. (Illecillewaet-Columbia drainage.)

Craigellachie Creek.—A tributary of Eagle river from the north, in township 23-6-6. (Eagle-Shuswap Lake-Thompson drainage.)

Cranberry Creek.—A tributary of Upper Arrow lake from the west near Arrowhead; mostly outside the Railway Belt. (Columbia drainage.)

Crazy Creek.—A tributary of Eagle river from the north at Taft, in township 23-5-6. Small power development. (Eagle-Shuswap Lake-Thompson drainage.)

Criss Creek.—An irrigation stream flowing into Deadman river from the east, in township 22-22-6. For hydrographic data see River Station on Criss creek. (Deadman-Thompson drainage.)

Cronkrite Creek.—A small tributary of the Upper Columbia river from the east, 20 miles south of Golden. The water is used for irrigation. The maximum discharge is not more than 5 c.f.s., and the stream generally dries up in the late summer. (Upper Columbia drainage.)

Crown Lake.—A small lake in Marble canyon, in township 21-27-6, flowing into Pavilion lake, thence to Fraser river. (Fraser drainage.)

Cultus Lake.—A mountain lake, 3 miles long, flowing into Sweltzer river, in township 22, E.C.M. (Sweltzer-Chilliwack-Fraser drainage.)

Cultus Lake.—A small lake at the head of a branch of Deadman river, in township 22-22-6. Of little or no importance.

Currie Creek.—Also called Bolean creek. (Q.V.)

Cypress Lake.—A small lake flowing into Stave lake from the east, in township 5-2-7. (Stave-Fraser drainage.)

Dairy Creek.—A small irrigation stream, a tributary of the North Thompson river from the west, in township 21-17-6. Now called Gordon creek. (North Thompson drainage.)

Dairy Creek.—A small irrigation stream flowing into Cherry creek, in township 20-19-6. For hydrographic data see River Station on Dairy creek. (Cherry-Thompson drainage.)

Dairy Lakes.—Two small lakes at the head of Dairy creek, in township 20-19-6. (Dairy-Cherry-Thompson drainage.)

Davis Creek.—Now called Fortunes creek.

Deadman River.—An important irrigation stream flowing from the north into Thompson river, in section 36, township 20-22-6. Deadman river supplies the water for the Barnes Estate at Walhachin. For hydrographic data see River Station on Deadman river. (Thompson drainage.)

Deadman Lake.—(Also called Snowhoost lake.) Just outside the northerly limit of the Railway Belt; 3 miles long, area 350 acres; storage dam 20 feet high; capacity of reservoir, 7,000 acre-feet. (Deadman-Thompson drainage.)

Debeck Creek.—A small stream flowing into Pitt lake from the west, in township 6-5-7.

Dennett Lake.—A small storage lake at the head of Gilley or Munroe creek.

Deep Creek.—Now called Otter river in Okanagan valley.

Deep Creek.—Now called Moulton creek.

Deer Creek.—A small tributary of Jamieson creek.

Deer Lake.—A small lake in township 5-28-6 at Ruby creek pass.

Disdero Lake.—A small lake in section 3, township 19-15-6 flowing into Robbins creek. (Robbins-Monte-Thompson drainage.)

Disappointment Lake.—A small lake near the head-waters of Coquitlam river, in township 7-6-7. (Coquitlam-Fraser drainage.)

Divide Lake.—Small lake at the head of Witch creek, in township 18-23-6. (Witch-Guichon-Nicola drainage.)

Dodd's Creek.—Now called Beard creek.

Dominick Lake.—A small lake flowing into Three-mile creek, in township 18-20-6; possible storage for irrigation. (Three-mile-Thompson drainage.)

Don Lake.—A small storage lake at the head of Young creek. (Brandt-Meslilloet drainage.)

Donald Creek.—A small stream flowing into the Columbia river from the south near Donald. (Columbia drainage.)

Douglas Creek.—A tributary of Nahatlatch river from the south, in township 12-27-6. (Nahatlatch-Fraser drainage.)

Downie Creek.—A tributary of Columbia river from the east, 50 miles north of Revelstoke, timber and mining; the source only is in the Railway Belt. (Columbia drainage.)

Drained Lake.—A small lake in township 21-18-6.

Dropping Water Creek.—A small irrigation stream flowing into Campbell creek, in township 17-17-6. (Campbell-South Thompson drainage.)

Dry Creek.—A small stream flowing into the South Thompson river, in township 19-11-6. Generally dry. (South Thompson drainage.) There are also numerous other streams called Dry creek which have not been identified.

Du Bois Lake.—A small lake draining into Tranquille river, in township 21-18-6. (Tranquille-Thompson drainage.)

Duchesnay Lake.—A small lake in Yoho valley, in township 29-18-5. (Yoho-Kicking Horse-Columbia drainage.)

Duffy Creek.—A small irrigation stream flowing into Kamloops lake from the south, in township 20-20-6. For hydrographic data see River Station on Duffy creek. (Thompson drainage.)

Duffy Lake.—A small lake suitable for storage purposes at the head of Duffy creek, in township 19-20-6.

Duncan River.—Rises in township 21-21-5, near the south limit of the Railway Belt and flows south into Lardeau river and Kootenay lake.

Dunville Creek.—A small stream flowing into Fraser river, in township 2-29-6. (Fraser drainage.)

Eagle River.—Forty miles long, rising in Eagle pass and flowing westerly, discharges into Shuswap lake at Sicamous. For hydrographic data see River Station on Eagle river. (Shuswap lake-Thompson drainage.)

Eagle Creek.—That part of Chehalis river above Chehalis lake.

Edith Lake.—A small lake at the headwaters of Peterson creek, in section 36 township 18-18-6. (Peterson-South Thompson drainage.)

Edwards Creek.—The north fork of Hefferly creek in township 22-16-6; used for irrigation. For hydrographic data see River Station on Edwards creek. (Hefferly-North Thompson drainage.)

Eight-mile Creek.—A small stream flowing into Thompson river in township 18-21-6. Now called Pukaist creek.

Eight-mile Creek.—A small irrigation stream flowing into Thompson river from the north in township 21-23-6. In June 13, 1911, the discharge was 0.7 c.f.s. (Thompson drainage.)

Elk Creek.—A small tributary of Fraser river, in township 26, E. C. M. (Fraser drainage.)

Elm Creek.—A very small stream in township 17-19-6.

Emerald Lake.—A lake of great scenic beauty at the head of Emerald river, 7 miles from Field.

Emerald River.—A small mountain stream, 10 miles long, rising in Emerald lake and flowing in a southwesterly direction, discharging into Kicking Horse river, 2 miles west of Field. For hydrographic data see miscellaneous measurements on Emerald river. (Kicking Horse-Columbia drainage.)

Emory Creek.—A small tributary of Fraser river from the west, in township 6-26-6; small power possibilities. (Fall of 1,150 feet in 3 miles). Discharge of 25 c.f.s. on December 9, 1912. (Fraser drainage.)

Ensign Creek.—A small mountain stream flowing into Blaeberry river from the east, in township 31-20-5. (Blaeberry-Columbia drainage.)

Erroch Lake.—A small lake in township 24, E.C.M., flowing into Nicomen slough, thence into Fraser river. (Fraser drainage.)

Essell Creek.—A small irrigation stream flowing from Summit lake into Salmon river at Grand Prairie, in township 17-13-6. For hydrographic data see River Station on Essell creek. (Salmon-Shuswap lake-Thompson drainage.)

Eureka Lake.—A small storage lake for irrigation purposes in the district south of Kamloops.

Eureka Creek.—A small tributary of Pitt river in township 5-4-7. (Pitt-Fraser drainage.)

Face Lake.—A lake about 1 mile long (elevation 4,840 feet) in township 18-20-6, flowing into Big Fish lake, thence into Greenstone creek. It is proposed to use this lake as a storage reservoir for irrigation purposes, diverting the water into Cherry creek watershed, but the drainage area is so small that it is doubtful if the quantity of water available would justify this proposal. (Greenstone-Meadow-Guichon-Nicola drainage.)

Fadear Creek.—A tributary of Louis creek from the east, in township 24-15-6 (Louis-North Thompson drainage.)

Falls Creek.—A small tributary of the Shuswap river from the north in township 19-7-6. Small power development possible. On October 8, 1911, the discharge was 3·4 c.f.s. (Shuswap-Thompson drainage.)

Ferguson Lake.—A small lake near the head-waters of Three-mile creek, in township 19-20-6.

Ferris Creek.—(Now called Warren creek, in township 17-12-6.)

Fifteen-mile Creek.—A small tributary of Upper Columbia river from the west, 15 miles south of Golden. (Upper Columbia drainage.)

Finney Lake.—A lake draining into Limestone creek, thence into Hat creek. The lake is situated in section 2, township 21-27-6. (Hat-Bonaparte-Thompson drainage.)

Fish Creek.—A small tributary of Campbell creek from the east, in township 17-17-6. (Campbell-South Thompson drainage.)

Fish Creek.—Now called Incomappleux river. (Q.V.)

Fish Lake.—(Also called Trout lake), a fishing resort about 20 miles south of Kamloops, in township 17-19-6. Elevation, 4,100 feet. (Meadow-Guichon-Nicola drainage.)

Fish Lake.—A small lake in section 5, township 18-16-6, and draining into Fish creek, thence into Campbell. (Fish-Campbell-South Thompson drainage.)

Five-mile Creek.—Now called Pimainus creek.

Flat Creek.—A small mountain stream flowing into Illecillewaet river from the south, in township 26-27-5. (Illecillewaet-Columbia drainage.)

Float Creek.—A small mountain stream flowing into Ottertail river, in township 27-18-5. (Ottertail-Kicking Horse-Columbia drainage.)

Fortunes Creek.—A tributary of Shuswap river from the south at Enderby, in township 18-9-6; municipal water supply and lighting plant for the town of Armstrong. For hydrographic data see River Station on Fortunes creek. Also called Davis creek. (Shuswap-South Thompson drainage.)

Fraser Creek.—A small stream flowing into Stump lake, in township 16-17-6. (Nicola-Thompson drainage.)

Fraser Creek.—A small tributary of Beaverfoot river, in township 25-19-5. (Beaverfoot-Kicking Horse-Columbia drainage.)

Fraser River.—One of the largest and best known rivers in British Columbia.

Freeze Creek.—A small tributary of Incomappleux river, in township 24-26-5. (Incomappleux-Columbia drainage.)

French Ned's Creek.—(Now called Ned's creek, in township 19-14-6.)

Frisby Creek.—A tributary of Columbia river from the west at the north limit of the Railway Belt, north of Revelstoke, in township 27-2-6. (Columbia drainage.)

Frisken Lake.—A small storage lake in township 16-16-6, flowing into Fraser creek, thence into Stump lake. (Fraser-Stump lake-Nicola drainage.)

Frog Creek.—(Also called Wap river.) Rises in the mountains south of Three Valley railway station and flows southerly into Mabel lake. (Mabel lake-Shuswap-South Thompson drainage.)

Frog Creek.—A small tributary of Deadman river, in township 22-20-6. (Deadman-Thompson drainage.)

Frog Lake.—An expansion of Frog creek, in township 22-5-6. (Frog-Mabel lake-Shuswap drainage.)

Frog Lake.—A small lake in township 18-18-6.

Garnet Creek.—A small stream flowing into Ruby creek, in township 5-27-6. (Ruby-Fraser drainage.)

Geikie Creek.—A small glacial stream flowing into the Incomappleux, in township 25-26-5. (Incomappleux-Columbia drainage.)

Valley of Five Mile Creek, near Spences Bridge, B. C.

Gilley Creek.—A small tributary of Pitt river from the west, in township 40, E.C.M.; small industrial power. Also called Munro creek. For hydrographic data see River Station on Gilley creek. (Pitt-Fraser drainage.)

Glacier Creek.—A small stream flowing into Slesse creek, a tributary of Chilliwack river, in township 1-28-6. (Slesse-Chilliwack-Fraser drainage.)

Greenough Creek. A small tributary of Kicking Horse river from the north, in township 27-20-5. Drainage area, 38 square miles. Estimated maximum discharge (June) 300 c.f.s. Estimated minimum discharge during the severe winter, 5 c.f.s. (Kicking Horse-Columbia drainage.)

Gold Creek. A tributary of Coquitlam river from the east, just below Coquitlam lake. See measurements of discharge on Gold creek. (Coquitlam-Fraser drainage.)

Gold Creek.—A tributary of Columbia river from the west, 17 miles north of Beavermouth, in township 32-26-5. (Columbia drainage.)

Gold Creek.—A small tributary of Columbia river from the west, in township 21-1-6, below Revelstoke.

Goodfellow Creek. A tributary of Bush river from the south, in township 33-24-5. (Bush-Columbia drainage.)

Goodsir Creek. A mountain torrent flowing into Ottertail river, in township 26-18-5. (Ottertail-Kicking Horse-Columbia drainage.)

Goose Lake. A small lake discharging into Sumas river, in township 20, E.C.M. (Sumas-Fraser drainage.)

Gordon Creek.—A small stream flowing into Fraser river from the west, in township 7-26-6. (Fraser drainage.)

Gordon Creek.—Probably the same creek as Dairy creek flowing into the North Thompson river, in township 21-17-6. See miscellaneous measurements on Gordon creek. (North Thompson drainage.)

Gorge Creek. A tributary of Deadman river, in township 23-22-6. (Deadman-Thompson drainage.)

Graingers Creek.—A small irrigation stream flowing into the upper Columbia river, in section 6, township 27-21-5. (Upper Columbia drainage.)

Granite Creek.—A small stream flowing into Salmon arm in township 21-10-6. (Shuswap lake-South Thompson drainage.)

Graves Creek. The lower part of Maiden creek, in township 23-26-6, flowing into Bonaparte river. On June 6, 1911, the discharge was 2 c.f.s. (Bonaparte-Thompson drainage.)

Greeley Creek.—A tributary of Illecillewaet river from the south, in township 23-1-6, proposed city of Revelstoke water supply. (Illecillewaet-Columbia drainage.)

Greenstone Creek.—A small irrigation stream rising in Face lake and Big Fish lake and flowing southerly into Meadow creek, in township 17-20-6. For hydrographic data see River Station on Greenstone creek. (Meadow-Guichon-Nicola-Thompson drainage.)

Griffin Lake.—A broadening of Eagle river, in township 23-4-6. (Eagle-Shuswap lake-South Thompson drainage.)

Grizzly Creek.—A mountain torrent flowing into Beaver river from the east, in township 27-25-5. (Beaver-Columbia drainage.)

Guichon Creek.—(Also called Ten-mile creek, Mamette creek, Na-a-a creek, Kazoom Kanaix), an important and contentious irrigation stream, rising in the Railway Belt, about township 19-22-6, and flowing southerly for 35 miles into Nicola river. For hydrographic data see River Station on Guichon creek. (Nicola-Thompson drainage.)

Haggen Lake.—A very small lake in section 35, township 20-13-6. (South Thompson drainage.)

Hamilton Creek.—Local name of small tributary of Illecillewaet river from the north near Revelstoke in township 24-1-6; city of Revelstoke water supply. (Illecillewaet-Columbia drainage.)

Haner Creek.—A small stream near Revelstoke.

Harper Lake.—A very small lake in section 34, township 20-13-6. (South Thompson drainage.)

Harrison Creek.—A small tributary of South Thompson river in township 20-14-6. (South Thompson drainage.)

Harrison Lake.—A large lake about 40 miles long and from 2 to 4 miles wide, emptying into Harrison river from the north. (Harrison-Fraser drainage.)

Harrison River.—A large tributary of Fraser river from the north, 60 miles east of Vancouver, in township 3-30-6. (Fraser drainage.)

Haskin Creek.—A small tributary of Ottertail river, in township 27-18-3. (Ottertail-Kicking Horse-Columbia drainage.)

Hat Creek.—An important and contentious irrigation stream rises in the hills about 15 miles west of Ashcroft and, after flowing 30 miles in a northerly direction, discharges into Bonaparte river, in township 22-25-6. For complete description and hydrographic data see River Station on Hat creek. (Bonaparte-Thompson drainage.)

Hatch Creek.—A very small stream flowing into Upper Columbia river from the east, in township 23-18-5. (Upper Columbia drainage.)

Hatzic Lake.—A tidal lake on the north side of Fraser river in the northeast corner of township 17, E.C.M. (Fraser drainage.)

Hays Creek.—A small stream near Revelstoke.

Hefferly Creek.—Also called Heffly and Hefferley, an important and contentious irrigation stream flowing into the North Thompson river from the east, in township 22-17-6. For hydrographic data see River Station on Hefferly creek. (North Thompson drainage.)

Hefferly Lake.—A small lake near the head of Hefferly creek, in section 1, township 22-16-6; used as a storage reservoir for irrigation purposes. (Hefferly-North Thompson drainage.)

Hicks Lake.—A small lake in township 4-28-6, flowing into Trout lake, thence into Harrison lake. (Trout lake-Harrison lake-Harrison-Fraser drainage.)

Hidden Lake.—A small lake in township 18-6-6, emptying northerly into Shuswap river. (Shuswap-Thompson drainage.)

Hihium Creek.—A tributary of Loon creek and Bonaparte river near the north limit of the Railway Belt. (Loon-Bonaparte-Thompson drainage.)

Hihium Lake.—In township [illegible] (elevation 4,500 feet), flowing westerly into Hihium creek.

Hixon Creek.—A small tributary of Mesliloet river from the east, in township 6-7-7. On October 29, 1912, the discharge was 71 c.f.s. Industrial power and logging. (Mesliloet drainage.

Hogranch Creek.—A small tributary of Upper Columbia river from the east, about 23 miles south of Golden, in township 24-19-5. On July 15, 1912, the discharge was 10·5 c.f.s. and this may be considered about the mean summer flow. (Upper Columbia drainage.

Holachten Creek.—A small stream in township 24, E.C.M., flowing into Nicomen slough, thence the Fraser river. (Fraser drainage.)

Hornet Creek.—A tributary of Silver creek, in township 7-29-6. (Silver-Harrison -Fraser drainage.)

Horse Creek.—A small tributary of Upper Columbia river from the east, in township 26-21-5. See miscellaneous measurements. (Upper Columbia drainage.)

Horsethief Creek.—A large tributary of Upper Columbia river from the west, 80 miles south of Golden; out-side the Railway Belt. For hydrographic data see River Station on Horsethief creek. (Upper Columbia drainage.)

Hospital Creek.—A small tributary of the Columbia river from the east, about 1 mile north of Golden, in township 27-22-5. Used for irrigation. (Columbia drainage.)

Howe Lake.—A small reservoir near the head of Jamieson creek. (Jamieson-North Thompson drainage.)

Huff Lake.—A small lake in township 23-16-6, emptying into Sullivan creek. (Sullivan-North Thompson drainage.)

Hughes Lake.—A small storage reservoir in township 19-19-6, into which the water of Alkali creek is diverted for irrigation purposes. (Alkali-Cherry-Thompson drainage.)

Hull Arden Creek.—A small tributary of Fraser river from the east above Lytton, in township 15-27-6. (Fraser drainage.)

Hummingbird Creek.—A small stream flowing into Mara lake from the east in township 21-8-6. (Shuswap-South Thompson drainage.)

Humphrey Lake.—Local name of small lake in township 17-19-6.

Hunakwa Lake.—A lake 3 miles long discharging southerly into Anstey creek, thence into Anstey arm of Shuswap lake. (Shuswap lake-South Thompson drainage.)

Hunger Creek.—A small stream in section 20, township 10-29-6.

Hunter Creek.—A small tributary of Fraser river from the south, in township 5-27-6. A little water is used for irrigation, and a small industrial power development is possible, with a high head (700 feet in 2 miles). (Fraser drainage.)

Hyak Creek.—A small tributary of Pitt lake, in township 6-4-7. (Pitt-Fraser drainage.)

Ice River.—The largest tributary of Beaverfoot river, in township 25-18-5. Scenic beauty and mining. (Beaverfoot-Kicking Horse-Columbia drainage.)

Illecillewaet River.—An important glacial stream rising in Illecillewaet glacier and flowing westerly into the Columbia at Revelstoke. Power, timber and scenic interests. For complete description and hydrographic data see River Station on Illecillewaet river. (Columbia drainage.)

Incomappleux River.—(Also called Fish creek). A stream about 42 miles long rising in the Selkirks behind Glacier, B.C., from mountains 8,000 feet to 10,000 feet high. It flows in a general southerly direction, discharging into north arm of Arrow Arrow lake near Comaplleux, at an elevation of 1,390 feet. Its drainage area is 460 sq. miles, being mostly timbered country, extensive limits being held by the Arrow Lakes Lumber Co. and the Dominion Saw-mills. There is practically no agricultural land in the valley. On September 16, 1912, at the mouth, the discharge was 1,520 c.f.s. The estimated maximum discharge in July is about 5,000 c.f.s. The estimated minimum discharge during the winter is about 100 c.f.s.

The stream is swift, from 50 feet to 150 feet wide, and from 3 feet to 10 feet deep. The river is not navigable, but is suitable for logging purposes.

The power possibilities on this stream are worthy of future investigation. There is a canyon about 2½ miles from the mouth. The canyon is 3,000 feet long, and there is a fall of 100 feet. Its width is from 60 feet to 100 feet, and the rocky banks are high and steep. There is very little natural storage and for a large development, artificial storage would be required. Water could be penned back over a large flat on which lies the old townsite of Canbourne. This would be an expensive installation.

Small summer industrial power of from 100 to 300 horse-power could be obtained on the following tributaries: Sable creek, Pool creek, Lexington creek and Boyd creek. The flow in each case is small, but high heads could be obtained.

Indian River.—Now called Mesliloet river.

Indian Garden Creek.—A small irrigation stream on the south of Thompson river in township 20-21-6, about 2 miles below Savona. (Thompson drainage.)

Indian Scottie Creek.—A small stream in the hills to the south of Oregon Jack creek.

Ingram Creek.—An irrigation stream flowing into Salmon river from the south, in township 17-13-6, near Grand Prairie. For hydrographic data see River Station on Ingram creek. (Salmon-Shuswap lake-South Thompson drainage.)

Inkatlsaph Creek.—A small tributary of Fraser river from the east, in township 12-26-6. (Fraser drainage.)

Inkikuh Creek.—A small tributary of Thompson river from the east near Spences Bridge, in township 18-24-6. Locally called Seven-mile creek. (Thompson drainage.)

Inkoika Creek.—A small tributary of Fraser river from the west, above Lytton, in township 16-27-6. (Fraser drainage.)

Intlpam Creek.—A small tributary of Fraser river from the west above Lytton, in township 17-27-6. (Fraser drainage.)

Island Pond.—Flows into Hefferly creek in township 22-16-6. (Hefferly-North Thompson drainage.)

Isaac Creek.—Now called Akolkolex river.

Izman Creek.—A small tributary of Fraser river from the east above Lytton, in township 16-27-6. (Fraser drainage.)

Jack Creek.—Also called Chartrand creek.

Jack Creek.—Also called Oregon Jack creek.

Jacko Creek.—A tributary of Peterson creek in township 19-18-6. The water is used for irrigation. For hydrographic data see River Station on Jacko creek. (Peterson-South Thompson drainage.)

Jones Creek.—(Called formerly Wahleach creek.) Flows from Jones lake, in township 3-27-6, into Fraser river. (Fraser drainage.)

Jones Creek and Lake.—Probably small tributary of Peterson creek, in township 19-17-6 or 19-18-6. Irrigation. (Peterson creek-Thompson drainage.)

Jones Lake.—A small lake situated in a valley high up in a spur of Cheam mountains, about 7 miles from Agassiz, in township 3-27-6, at an elevation of about 1,950 feet (barometer). The drainage area is 40 square miles. It discharges northerly into Jones creek (formerly called Wahleach creek), thence into Fraser river.

Hydrographic investigations of the flow from Jones lake have been carried on for two years for the Vancouver Power Company by Messrs. Anderson and Warden, civil engineers, of Vancouver, with a view to developing water-power. It is proposed to divert Jones lake by means of a tunnel through the mountains due west of the lake, installing the power house in the Fraser valley. In this way a head of some 1,800 feet would be obtained. The tunnel would be about 2 miles long.

Jones lake would be used as a reservoir. Its area is about 1,260 acres, and a 50-foot dam would be constructed.

The precipitation around Jones lake is about 70 to 80 inches per annum. (Fraser drainage.)

Jacko Lake.—Receives the waters of Jacko creek, then drains into Peterson creek, in township 19-18-6. Used as a storage reservoir. (Peterson-South Thompson drainage.)

James Creek.—A small irrigation stream in township 21-22-6, flowing from Twin lakes (now used as a storage reservoir) into Thompson river, near Walhachin. The waters of this creek are used by the British Columbia Horticultural Estate for irrigation purposes, but as the supply is very small, the waters of Barnes creek are diverted across the divide into Lake of the Woods reservoir (in section 14, township 20-23-6) thence into Twin Lakes reservoir, thence down the bed of James creek.

Jamieson Creek.—An important irrigation stream flowing into North Thompson river from the west, in township 22-17-6. This creek supplies the water for the large British Columbia Fruitlands irrigation canal. For hydrographic data see River Station on Jamieson creek. (North Thompson drainage.)

Jamieson Creek.—A small tributary of Fraser river from the east, in township 12-26-6. (Fraser drainage.)

Jim Black's Lake.—A small lake in Highland valley, in township 18-24-6.

Jimmies Creek.—A small stream on the south side of Thompson river, in township 20-22-6. (Thompson drainage.)

Johnstons Creek.—A small tributary of Shuswap river in township 20-8-6. (Shuswap-South Thompson drainage.)

Johnston Draw Creek.—Probably flows into Nelson creek, thence into Columbia river, 18 miles south of Golden. (Nelson-Upper Columbia drainage.)

Jordan River.—About 20 miles long. It has its source about township 25-3-6 in the snow-capped peaks of the Gold range and, flowing in a southeasterly direction, empties into the Columbia river near Revelstoke. Its drainage area is 100 square miles. The drainage area is mostly timbered, and the valley near its source is open rolling country, but near the mouth is heavily timbered. There is some agricultural land at the head of the river, but it is at a rather high elevation.

An estimated maximum discharge in July is 2,000 c.f.s.; the estimated minimum discharge is 50 c.f.s. during the severe winter. The stream is swift, 30 feet to 100 feet wide and 3 feet to 10 feet deep, and is not navigable.

The average precipitation is about 40 inches per annum (30 inches rain and 120 inches snow.)

The power possibilities of this stream are worthy of future investigation. Two miles from the mouth there is a canyon 1,500 feet long in which the fall is 80 feet. Below the canyon is the Jordan falls, with a drop of 20 feet. In an S-shaped canyon below the falls there is a fall of 55 feet. (Columbia drainage.)

July Creek.—A small tributary of the head-waters of Coldwater river, in township 9-23-6. (Coldwater-Nicola-Thompson drainage.)

Jules Lake.—A small lake in township 24-21-6. (Deadman-Thompson drainage.)

Kamloops Lake.—A broadening of the Thompson river; some 20 miles long and from 2 to 3 miles wide.

Kanaka Creek.—A small stream flowing into the Fraser river near Haney, in township 12 E.C.M. (Fraser drainage.)

Kawkawa Lake.—Draining into Coquihalla river near Hope in township 5-22-6. (Coquihalla-Fraser drainage.)

Kazoom Kanaix.—Now called Guichon creek. (Q.V.)

Keikum Creek.—A tributary of the Fraser river from the east, in township 6-22-6. (Fraser drainage.)

Kellie Creek.—A tributary of Incomappleux river from the east, in township 22-26-5. (Incomappleux-Columbia drainage.)

Kenuff Lake.—Also called Knouff lake, draining into Sullivan creek, in township 23-16-6. Recorded for irrigation purposes. (Sullivan-North Thompson drainage.)

Kicking Horse River.—An important river, rising in Kicking Horse pass in the summit of the Rocky mountains, and flowing in a westerly direction into Columbia river at Golden. Timber, mining, power and scenic interests. For complete description and hydrographic data see River Station on Kicking Horse river. (Columbia drainage.)

Kingfisher Creek.—A small tributary of Shuswap river from the north, near Mabel lake, in township 19-6-6. (Shuswap-South Thompson drainage.)

Kiwetinok River.—A tributary of Amiskwi river, in township 28-19-5. (Amiskwi-Kicking Horse-Columbia drainage.)

Klesilkwa Creek.—A tributary of Skagit river; thence into United States; township 2-25-6.

Klowa Creek.—A tributary of the Fraser river from the west, in township 14-27-6, just below Lytton. (Fraser drainage.)

Kootenay River.—One of the most important rivers in British Columbia; has its source near the south limit of the Railway Belt, in township 24-17-5.

Kwellanka Creek.—A small tributary of Fraser river from the west, in township 14-27-6, just below Lytton. (Fraser drainage.)

Kwoiek Creek.—A tributary of Fraser river from the west, in township 13-27-6. (Fraser drainage.)

Lambkin Creek.—A small tributary of Columbia river from the east, 2 miles below (north of) Golden, in township 27-22-5. (Columbia drainage.)

Ladner Creek.—A tributary of Coquihalla river, in township 6-24-6. (Coquihalla-Fraser drainage.)

La Forme Creek.—A small tributary of Columbia river from the east, in township 26-2-6, above Revelstoke. Timber and mining interests. (Columbia drainage.)

Laluwissin Creek.—A small tributary of Fraser river from the east, above Lytton, in township 17-27-6, (Fraser drainage.)

Lanes Creek.—A small irrigation stream flowing into North Thompson river at the north boundary of township 21-17-6. See miscellaneous measurements on Lanes creek. (North Thompson drainage.)

Last Chance Creek.—Flows into Deadman lake (outside Railway Belt). Deadman-Thompson drainage.)

Last Chance Creek.—Now called Stein creek.

Leighton Lake.—A small storage lake, in township 19-21-6, beside Tunkwa lake, into which the waters of Upper Guichon creek are diverted, stored and conducted down Three-mile creek for irrigation purposes. Sometimes called Little lake. (Three-mile-Thompson drainage.)

Lemonade Creek.—A small tributary of Columbia river from the east, in township 26-21-5, 4 miles south of Golden. The water is used for domestic and irrigation purposes. (Upper Columbia drainage.)

Leighton Lake, B. C.

Lewis Creek.—A small tributary of Sumas lake, in township 23, E.C.M. (Sumas-Fraser drainage.)

Lexington Creek.—A small tributary of Incomappleux river from the east, in township 22-7-5. Timber and possibly small power. (Incomappleux-Columbia drainage.)

Lihumitson River.—A tributary of Chilliwack river from the south, in township 25, E.C.M. (Chilliwack-Sumas-Fraser drainage.)

Lillooet Lake.—A lake some 8 miles long at the head of Lillooet river. (Lillooet-Pitt-Fraser drainage.)

Lillooet River.—Rises in Lillooet lake, in township 4-4-7, and flows into Pitt river in township 40, E.C.M. This river is tidal for 5 or 6 miles from its mouth. Important timber and power interests. For complete description and hydrographic data see River Station on Lillooet river. (Pitt-Fraser drainage.)

Limestone Creek.—A small tributary of Hat creek from the west in township 20-27-6. (Hat-Bonaparte-Thompson drainage.)

Little Lake.—Now called Leighton lake.

Little Shuswap Lake.—A broadening of the Thompson river just below Shuswap lake, and near Chase, B.C. (South Thompson drainage.)

Lloyd Creek.—A small tributary of Paul creek, in township 20-16-6. See miscellaneous measurements. (Paul-North Thompson drainage.)

Loakin Creek.—Flows into Niskonlith lake, in township 21-13-6. (South Thompson drainage.)

Log Creek.—A tributary of Nahatlatch river from the north, in township 12-27-6. (Nahatlatch-Fraser drainage.)

Long Lake.—A small lake in township 18-17-6. (Campbell-South Thompson drainage.)

Loon Creek.—A trib[illegible]y of Bonaparte river from the east, just outside the Railway Belt. (Bonaparte-T[illegible]pson drainage.)

Loon Lake.—At the [illegible]d of Loon creek; it is proposed to use this lake as a storage reservoir for irrigation purposes along the Bonaparte river. (Loon-Bonaparte-Thompson drainage.)

Loon Lake.—A tiny lake in section 7, township 22-10-6. (Shuswap-Thompson drainage.)

Loon Lake.—Draining into the north Fork of Spillimacheen river, in township 24-21-5. (Spillimacheen-Upper Columbia drainage.)

Loop Creek.—A small tributary of Illecillewaet river from the south, passing under the Loop near Glacier, in township 26-26-5. (Illecillewaet-Columbia drainage.)

Lopez Creek.—A tributary of Cache creek, in township 21-24-6; a very small irrigation stream. (Cache-Bonaparte-Thompson drainage.)

Louis Creek.—Rises in township 22-15-6 and flows north and west into North Thompson river, about 40 miles north of Kamloops. Mining, irrigation and small power. (North Thompson drainage.)

Louis Lake.—A small lake emptying into Paul lake, in township 21-16-6. (Paul-North Thompson drainage.)

Luckachin Creek.—A tributary of Nicola river from the east, in township 16-24-6. (Nicola-Thompson drainage.)

Luckakuck River.—The original channel of Chilliwack river, in township [illegible], E.C.M., from which the latter was diverted down the Vedder river channel. (Sumas-Fraser drainage.)

Lytton Creek.—A small tributary of the Fraser from the east of the town of Lytton: C.P.R. and town of Lytton water supply. (Fraser drainage.)

Macaulay Creek.—Probably a tributary of Lanes creek, in township 22-17-6. (Lanes-North Thompson drainage.)

McArthur Creek.—A tributary of the Ottertail river from the east, in township 27-17-5. (Ottertail-Kicking Horse-Columbia drainage.)

McArthur Lake.—A beautiful lake in the heart of the Rocky mountains, in township 27-17-5.

McCallum Creek.—A small irrigation stream on the south side of Thompson river in township 20-21-6. Also called Upper Ranch creek. (Thompson drainage.)

McDougal Creek.—A tributary of Incomappleux river from the west, in township 23-26-5. Timber interests. (Incomappleux-Columbia drainage.)

McGillivray Creek.—A tributary of Louis creek from the east, in township 22-15-6. Irrigation and small power. On August 21, 1912, the discharge was 5·5 c.f.s. (Louis-North Thompson drainage.)

McGillivray Creek.—A small tributary of Sumas river, in township 20 E.C.M. (Sumas-Fraser drainage.)

McLean Lake.—A small lake at the head-waters of Cornwall creek, in township 21-25-6 (Cornwall-Thompson drainage.)

McLean Creek.—Small tributary of Canyon creek, in township 26-22-5. Timber. (Canyon-Upper Columbia drainage.)

McMurdo Creek.—A tributary of North Fork of Spillimacheen river from the south, in township 25-23-5. Mining interests. (Spillimacheen-Upper Columbia drainage.)

McQueen Creek.—A small irrigation stream flowing into North Thompson river from the west, near Dairy creek, in township 21-17-6. (North Thompson drainage.)

McRae Creek.—A tributary of Incomappleux river from the west, in township 22-27-5. Timber and small power. (Incomappleux-Columbia drainage.)

Mabel Lake.—A lake 18 miles long, and from 1 to 2 miles wide, draining into Shuswap river, in township 19-6-6. Good storage for proposed power development on Shuswap river. (Shuswap-South Thompson drainage.)

Maiden Creek.—A small tributary of Allen creek in township 23-26-6. Irrigation. The water of Maiden creek sinks in one place and, where it rises, it is called Graves creek. (Allen-Bonaparte-Thompson drainage.)

Maleys Creek.—A small stream in township 24-2-6, near Revelstoke.

Mamit Creek.—Now called Guichon creek (Q.V.)

Mamit Lake.—(Or Mamette lake).—An expansion of Guichon creek, just outside the Railway Belt. A possible storage reservoir for Guichon creek waters at Lower Nicola. (Guichon-Nicola drainage.)

Manitoba Creek.—A very small stream in township 25-20-5, south of Golden. (Upper Columbia drainage.)

Mann Creek.—A small stream in township 17-10-6.

Manson Creek.—A small creek flowing into Shuswap lake from the north, in township 23-10-6. (Shuswap lake-South Thompson drainage.)

Mara Lake.—A broadening of Shuswap river just as it enters Shuswap lake at Sicamous. (Shuswap-South Thompson drainage.)

Upper end of Manuit Lake at low water.

Maria Slough.—A side channel of Fraser river in township 4-28-6. (Fraser drainage.)

Marion Lake.—A small scenic mountain lake in township 26-26-5. (Illecillewaet-Columbia drainage.)

Marl Creek.—A tributary of Columbia river from the north, near Donald, in township 29-23-5. (Columbia drainage.)

Martin Creek.—A small irrigation stream flowing into the South Thompson river from the south, in township 20-14-6. See miscellaneous measurements. (South Thompson drainage.)

Meadow Creek.—The largest tributary of Guichon creek, rising in Long Lake Forest Reserve and flowing westerly. Used for irrigation. For hydrographic data see River Station on Meadow creek. (Guichon-Nicola-Thompson drainage.)

Meadow Creek.—A small tributary of Shuswap lake from the north, in township 23-10-6. (Shuswap lake-South Thompson drainage.)

Medicine Creek.—A small tributary of Hat creek from the east, generally dry, in township 21-26-6. (Hat-Bonaparte-Thompson drainage.)

Menanteau Lake.—A tiny lake in section 12, township 18-18-6.

Menhenick Creek.—A small tributary of Incomappleux river from the west, in township 21-27-5. (Incomappleux-Columbia drainage.)

Mesliloet River.—(Also called Indian river). A stream flowing into the North Arm of Burrard inlet from the north, and forming the westerly boundary of the Railway Belt; small power developments possible. For complete description and hydrographic data see River Station on Mesliloet river.

Middle Creek.—A small tributary of Nesakwatch river in township 1-26-2. (Nesakwatch-Chilliwack-Fraser drainage.)

Mill Creek.—A tributary of the northeast arm of Upper Arrow lake in township 21-28-5. (Columbia drainage.)

Mill Creek.—A small stream flowing into Eagle river, near Three Valley, in township 23-4-6. (Eagle-Shuswap lake-Thompson drainage.)

Mill Creek.—A small tributary of Tonka Watla river, in township 23-2-6. (Tonka-Watla-Columbia drainage.)

Miller Lake.—A small lake in township 19-13-6.

Minnaberriet Creek.—A small irrigation stream flowing into Thompson river from the west, in township 20-24-6. Generally dry. (Thompson drainage.)

Misko Creek.—A tributary of Ottertail river, in township 26-17-5. (Ottertail-Kicking Horse-Columbia drainage.)

Mitre Creek.—A very small tributary of Incomappleux river, at its head-waters, in township 25-26-5. (Incomappleux-Columbia drainage.)

Monte Creek. An important and contentious irrigation stream rising in Monte Hills Forest Reserve and, flowing northerly, discharging into South Thompson river at Ducks. For complete description and hydrographic data see River Station on Monte creek. (South Thompson drainage.)

Monte Lake.—Now called Summit lake.

Moore Creek.—Rises in the Railway Belt, in township 16-18-6, and flows southerly into Nicola lake. (Nicola-Thompson drainage.)

Moose Creek.—A small tributary of Beaverfoot river, near its head, in township 24-17-5. (Beaverfoot-Kicking Horse-Columbia drainage.)

Morneilun Creek.—A small tributary of Fraser from the east, in township 13-27-6. (Fraser drainage.)

Morris Lake.—A small lake in Morris river, in township 4-29-16.

Morris River.—Flows into Harrison river in township 4-29-6. Government fish hatchery. (Harrison-Fraser drainage.)

Mosky Lake.—A tiny lake in section 4, township 22-10-6.

Moulton Creek.—A small irrigation stream flowing into South Thompson river, in township 20-14-6. See hydrographic data on Moulton creek.

Mountain Creek.—A mountain torrent flowing into Beaver river from the west, in township 29-25-5. (Beaver-Columbia drainage.)

Mountain Creek.—East fork of Canoe creek, in township 20-9-6. City of Salmon Arm water supply. (Canoe-Shuswap lake-Thompson drainage.)

Mowhokam Creek.—A small tributary of Fraser river from the east, in township 12-26-6. (Fraser drainage.)

Mowich Lake.—Near Deadman river, in township 24-21-6.

Mummery Creek.—A glacial stream 2 miles long, flowing into Blaeberry river, in township 31-20-5. (Blaeberry-Columbia drainage.)

Munro Creek.—Also called Gilley creek. (Q.V.)

Murray Creek.—A tributary of Thompson river from the northwest, in township 17-25-6. Irrigation, power and domestic supply. See River Station on Murray creek. (Thompson drainage.)

Murray Lake.—Drains into Coldwater river, in township 10-23-6. (Coldwater-Nicola-Thompson drainage.)

Na-a-a River.—Now called Guichon creek.

Nahatlatch Lakes.—A chain of four narrow lakes, in townships 12-27-6 and 12-28-6; suitable for storage reservoirs for power purposes. (Nahatlatch-Fraser drainage.)

Nahatlatch River.—Sometimes called Salmon river, an important tributary of Fraser river from the west, in township 12-26-6. Timber and power. For complete description and hydrographic data see River Station on Nahatlatch river. (Fraser drainage.)

Napier Lake.—A narrow lake 1 mile long at the head-waters of Campbell creek, in township 17-17-6. (Campbell-South Thompson drainage.)

Narao Lake.—A small mountain lake south of Hector, in township 28-17-5 (Kicking Horse-Columbia drainage.)

Navy Creek.—A tributary of the south fork of Bush river, in township 32-23-5. (Bush-Columbia drainage.)

Ned's Creek.—A small irrigation stream flowing into South Thompson river from the south, in township 19-14-6. See miscellaneous measurements. (South Thompson drainage.)

Nekertch Creek.—A small tributary of Fraser river from the west, above Lytton, in township 16-27-6. (Fraser drainage.)

Nekliptum Creek.—A small tributary of Fraser river from the east, in township 13-27-6. (Fraser drainage.)

Nelson Creek.—A small irrigation stream flowing into Thompson river, in township 20-24-6. See hydrographic data of River Station on Nelson creek. (Thompson drainage.)

Nelson Creek.—A small irrigation stream flowing into the Columbia river from the east, in section 9, township 25-20-5. On July 15, 1912, the discharge was 2 c.f.s. (Upper Columbia drainage.)

Nelson Lake.—A small lake in township 20-24-6, draining into Nelson creek. (Nelson-Thompson drainage.)

Nepopulchin Creek.—A small tributary of Fraser river from the west, in township 11-26-6. (Fraser drainage.)

Nepuchin Creek.—A small tributary of Fraser river, in township 16-27-6. (Fraser drainage.)

Nesakwatch Creek.—A tributary of Chilliwack river from the south in township 1-27-6. (Chilliwack-Fraser drainage.)

Nescautell Creek.—Now called Niskonlith creek.

Newman Lake.—Now called Trapp lake.

Nicola River.—An important tributary of Thompson river rising in Nicola lake, and, flowing for 50 miles in a northerly direction, discharging into Thompson river at Spences Bridge. For complete description and hydrographic data see River Station on Nicola river. (Thompson drainage.)

Nicolson Creek.—A very small tributary of Upper Columbia river from the east, in township 26-21-5, between 4 and 5 miles from Golden. (Upper Columbia drainage.)

Nicolum River.—A tributary of Coquihalla river, in township 5-25-6. (Coquihalla-Fraser drainage.)

Nicomekl River.—A small river flowing into Boundary bay, in township 1, W. C.M.

Nicomen River.—A small tributary of Thompson river from the east, in township 15-25-6. (Thompson drainage.)

Niger Creek.—A small tributary of Fraser river from the east, in township 13-27-6. (Fraser drainage.)

Nikaia Creek.—A small tributary of Fraser from the west, in township 14-27-6, below Lytton. See miscellaneous measurements. (Fraser drainage.)

Nikwa Creek.—A small tributary of Fraser river from the west, in township 16-27-6, above Lytton. (Fraser drainage.)

Nikwikwaia Creek.—Flows into Adams river from the east, just below the outlet of the lake. (Adams-Shuswap lake-South Thompson drainage.)

Ninemile Creek.—A small tributary of Fraser river from the east, in township 11-26-6. (Fraser drainage.)

Ninemile Creek.—A small tributary of Upper Columbia river from the east, in township 26-21-5. (Upper Columbia drainage.)

Niskonlith Creek.—A small stream flowing into South Thompson river from the north, in township 21-13-6. Used for irrigation. (South Thompson drainage.)

Niskonlith Lake.—A lake 3 miles long, in township 21-13-6, emptying into Niskonlith creek.

Noble Creek.—Also called Lane creek.

Nohomin Creek.—A tributary of Fraser river from the west, in township 15-27-6, just above Lytton. A contentious irrigation stream. (Fraser drainage.)

Noisy Creek.—A small stream flowing into Mabel lake from the north, in township 20-5-6. (Mabel lake-Shuswap-South Thompson drainage.)

North Lillooet River.—A branch of Lillooet river flowing mostly through Pitt river Meadows. See hydrographic data on North Lillooet river. (Lillooet-Pitt-Fraser drainage.)

Norton Creek.—A tributary of Brandt creek, thence of Mesliloet river from the east in township 6-7-7. Timber and small power. On October 20, 1912, the discharge was 7·7 c.f.s. (Mesliloet drainage.)

Norton Lake.—A small storage lake at the head of Norton creek.

No. 2 Creek.—A tributary of Upper Columbia river from the west, 9 miles below lake Windermere. The water is used for irrigation. Outside the Railway Belt. For hydrographic data see River Station on No. 2 creek. (Upper Columbia drainage.)

Novelist Creek.—A small tributary of Gold creek, in township 31-27-5. (Gold-Columbia drainage.)

Nuaitch Creek.—A small tributary of Nicola river, in township 14-23-6. (Nicola-Thompson drainage.)

Oesa Lake.—A scenic mountain lake emptying into Cataract creek, in township 27-17-5. (Cataract-Kicking Horse-Columbia drainage.)

O'Hara Lake.—A scenic mountain lake emptying into Cataract creek, in township 27-17-5. (Cataract-Kicking Horse-Columbia drainage.)

Oregon Jack Creek.—A contentious irrigation stream rising in the Hat Creek Forest Reserve and flowing easterly into the Thompson, in township 19-24-6. For hydrographic data see River Station on Oregon Jack creek. (Thompson drainage.)

Osprey Creek.—A small stream flowing into Pitt lake, in township 6-4-7. (Pitt-Fraser drainage.)

Otter Lake.—A small lake in section 2, township 14, E.C.M. (Fraser drainage.)

Otter Lake.—A small lake at the south limit of the Railway Belt in Okanagan valley. (Okanagan lake-Okanagan-Columbia drainage.)

Otter River.—(Also called Deep creek.)—A small stream flowing southerly into Otter lake in Okanagan valley.

Otterhead River.—A mountain stream, about 12 miles long, flowing in a southerly direction into Kicking Horse river, in township 27-19-5. It has a drainage area of 30 square miles. The water is used for lumbering. At the mouth, the stream is about 25 feet wide and from 2 feet to 3 feet deep. Estimated maximum discharge in June is 250 c.f.s. Estimated minimum discharge in winter is 5 c.f.s. (Kicking Horse-Columbia drainage.)

Otto Creek.—A tributary of Amiskwi river in township 29-19-5. (Amiskwi-township 27-19-5. For complete description, etc., see River Station on Ottertail river. (Kicking Horse-Columbia drainage.)

Otto Creek.—A tributary of Amiskwi river in township 29-19-5. (Amiskwi-Kicking Horse-Columbia drainage.)

Owens Creek.—A small stream near Salmon Arm, in township 20-10-6.

Owl's Head Creek.—A small stream flowing into Eagle river, in township 22-7-6. (Eagle-Shuswap lake-South Thompson drainage.)

Palmers Creek.—A small tributary of Salmon river, in township 20-10-6, near Salmon Arm. See miscellaneous measurements on Palmers creek. (Salmon-Shuswap lake-South Thompson drainage.)

Palmers Meadows.—In township 17-17-6, near the head-waters of Campbell creek.

Pants Creek.—A small tributary of Jamieson creek, in township 22-17-6. (Jamieson-North Thompson drainage.)

Papsilqua Creek.—A small stream flowing into Nicola river, in township 16-23-6. (Nicola-Thompson drainage.)

Parks Creek.—A small stream flowing into Hat creek, in township 22-26-6; used for irrigation. (Hat-Bonaparte-Thompson drainage.)

Pass Creek.—A small tributary of Adams lake from the west, in township 21-14-6. (Adams-Shuswap-South Thompson drainage.)

Pass Lake.—A small lake emptying into Watching creek, in township 22-18-6. (Watching-Tranquille-Thompson drainage.)

Pasulko Lake.—A small lake in township 17-26-6.

Paul Creek.—Also called Reserve creek, Reservation creek and Schedam creek, an important irrigation stream rising in Ni-koulith Forest Reserve and flowing in a westerly direction through Kamloops Indian Reserve into North Thompson river, about 2 miles from Kamloops. Irrigation, and possibly small summer power. For hydrographic data see River Station on Paul creek. (North Thompson drainage.)

Paul Lake.—A good storage reservoir on Paul creek, in township 20-16-6.

Paxton Creek.—A small stream flowing into Monte creek from the east, in township 18-14-6. Used for irrigation. (Monte-South Thompson drainage.)

Pearse Creek.—The stream shown on Dominion maps as Pearse creek is really upper Monte creek, in township 16-14-6. Stream locally called Pearse creek flows into Monte creek from the west, in township 18-14-6. (Monte-South Thompson drainage.)

Pemberton Creek.—A small irrigation stream flowing into South Thompson river from the north, in township 20-14-6. For hydrographic data see River Station on Pemberton creek. (South Thompson drainage.)

Pendleton Creek.—A small tributary of Cherry creek, in section 4, township 20-19-6. For hydrographic data see River Station on Pendleton creek. (Cherry-Thompson drainage.)

Penhantan Lake.—Now called Pinantan lake.

Pennies Creek.—Or Penny creek, now called Barnes creek. (Q. V.)

Pennies Lakes.—Now called Twin lakes, in section 25, township 20-23-6. (Q. V.)

Peterson Creek.—A small irrigation stream in township 19-17-6, flowing through the city of Kamloops into South Thompson river. See miscellaneous measurements of the spring flood of Peterson creek in the city of Kamloops. (South Thompson drainage.)

Petit Creek.—Now called Spius creek. (Q. V.)

Pierre River.—A tributary of Coquihalla river, in township 5-25-6. (Coquihalla-Fraser drainage.)

Piglog Creek.—A small tributary of Fraser river from the east, in township 13-27-6. (Fraser drainage.)

Pillar Lake.—At the head-waters of Chase creek, in township 19-12-6. (Chase-South Thompson drainage.)

Pimainus Creek.—Also called Five-mile creek, a tributary of Thompson river from the east, in township 17-24-6, near Spences Bridge. (Thompson drainage.)

Pimainus Lakes.—A chain of small lakes at the head-waters of Pimainus creek, in township 17-23-6. Possible storage for irrigation purposes.

Pinantan Lake.—An enlargement of Paul creek, in section 28, township 20-15-6; good fishing. (Paul-North Thompson drainage.)

Pinaus Lake.—A lake, 2 miles long, in township 17-12-6, draining into Equesis creek, thence into Okanagan lake.

Pipseul Creek.—Now called Meadow creek, a tributary of Guichon creek.

Pit Lake.—Small lake, probably in township 19-17-6 or 19-18-6. (Thompson drainage.)

Pitt Lake.—A tidal lake, about 15 miles long, and from 2 to 4 miles wide, flowing into Pitt river.

Pitt River.—An important navigable stream (tidal) flowing into Fraser river from the north, about 6 miles from New Westminster. (Fraser drainage.)

Pocock Creek.—A small tributary of upper Hat creek from the west, in township 19-26-6. Irrigation. (Hat-Bonaparte-Thompson drainage.)

Pollard Creek.—A small stream flowing into Pitt river from the west, in township 40 E.C.M. For hydrographic data see River Station on Pollard creek. (Pitt-Fraser drainage.)

Porcupine Creek.—A mountain stream, 8 miles long, flowing into Kicking Horse river from the west, near the north boundary of township 26-19-5. No developments or cultivation of any kind along the creek. There is a little timber in the valley. Drainage area is 30 square miles. Estimated maximum discharge in June, 250 c. f. s. Estimated minimum discharge in winter, 5 c. f. s. (Kicking Horse-Columbia drainage.)

Prattle Creek.—A tributary of Bush river from the north, in township 32-25-5. (Bush-Columbia drainage.)

Prospect Creek.—A small tributary of Spius creek in township 12-23-6. (Spius-Nicola-Thompson drainage.)

Pudlark Creek.—A very small tributary of Fraser river from the east, in township 6-26-6. (Fraser drainage.)

Pukaist Creek.—Also called Eight-mile creek, a tributary of Thompson river from the east, in township 18-24-6. (Thompson drainage.)

Quartz Creek.—A small tributary of Columbia river from the south, in township 29-25-5, at Beavermouth. Drainage area, 45 square miles. There are several water records on Quartz creek, one by the Columbia River Lumber Company for milling purposes, one by the Canadian Pacific Railway for railway purposes, and one for mining purposes for some placer claims near the mouth of Quartz creek. There are no agricultural or timber interests in the valley of Quartz creek. Estimated maximum discharge in July is 500 c. f. s. Estimated minimum discharge in winter is 8 c. f. s. (Columbia drainage.)

Queest Creek.—Flows into Anstey arm of Shuswap lake from the east, in township 24-7-6. (Shuswap lake-South Thompson drainage.)

Quenville Creek.—A small irrigation stream flowing into Guichon creek from the east, about 1 mile above Mamit lake. It has a drainage area of 7 square miles. It is a flashy stream which runs dry early in July. See miscellaneous measurements of discharge on Quenville creek. (Guichon-Nicola-Thompson drainage.)

Rae Creek or Ray Creek.—A small irrigation stream from the east, just below Mamit lake, flowing into Guichon creek; outside the Railway Belt. (Guichon-Nicola-Thompson drainage.)

Rainbow Creek.—A stream flowing into Pitt lake from the east, in township 6-4-7. See hydrographic data. (Pitt-Fraser drainage.)

Raven Creek.—Now called Rushton creek. (Q.V.)

Red Lake.—At the head-waters of Criss creek, in township 22-21-6. (Criss-Deadman-Thompson drainage.)

Renicker Creek.—A small tributary of Salmon arm of Shuswap lake, in township 21-9-6. (Shuswap lake-South Thompson drainage.)

Reserve Creek or Reservation Creek.—Now called Paul creek. (Q. V.)

Richardson Creek.—A tributary of Spius creek, in township 13-23-6. (Spius-Nicola-Thompson drainage.)

Richardson Lake.—At the head of Deer creek, a tributary of Jamieson creek, in township 22-17-6. (Deer-Jamieson-North Thompson drainage.)

Ridge Lake.—A small lake at the head of Meadow creek, in township 17-19-6. (Meadow-Guichon-Nicola drainage.)

Robbins Creek.—A tributary of Monte creek from the west, in township 19-15-6. The water is used for irrigation. See River Station on Robbins creek. (Monte-South Thompson drainage.)

Roche Lake.—A lake 2 miles long, in township 17-16-6.

Rodero Lake.—Near Barnes creek, near Ashcroft.

Roper Lake.—A small storage reservoir on Cherry creek, in township 19-19-6. (Cherry-Thompson drainage.)

Ross Creek.—A small tributary of Shuswap lake from the north, in township 2[illegible] 9-6. (Shuswap lake-South Thompson drainage.)

Ross Lake.—A small lake in township 17-18-6.

Ross Lake.—A small lake in the great divide, in township 28-17-5, emptying into Kicking Horse river. (Kicking Horse-Columbia drainage.)

Rough Creek.—A tributary of Fraser river from the east, in township 18-28-6. (Fraser drainage.)

Round Lake.—A small lake in the Okanagan divide, in township 17 [illegible] 6

Ruby Creek.—A small tributary of Fraser river from the north, in township 5-27-6. (Fraser drainage.)

Rushton Creek.—A tributary of Pitt lake from the east, in township [illegible] 7. Proposed water-power development for industrial purposes. (Rock crushing and [illegible]ing.) It is possible to obtain a head of 650 feet. On November 3, 1912, the discharge was 63 c.f.s. Small storage can be obtained on a lake less than 2 miles from the mouth. (Pitt-Fraser drainage.)

Rushton Lake.—A small lake on Rushton creek, in section 18, township 5-4-7.

Sable Creek.—A small tributary of Incomappleux river from the west, in township 22-27-5. Small power and timber interests. (Incomappleux-Columbia drainage.)

Sackum Creek.—A small tributary of Thompson river from the ea[illegible] in township 15-25-6. (Thompson drainage.)

Salmon Arm.—The most southerly arm of Shuswap lake.

Salmon Creek.—A tributary of northeast arm of Upper Arrow lake (outside the Railway Belt.) Drainage area, 57 square miles. Logging interests and possible water-power developments. A head of 1,100 feet may be obtained in 3 miles. Two small storage lakes. On September 16, 1912, the discharge was 58 c.f.s. (Columbia drainage.)

Salmon River.—A small tributary of Fraser river from the south, in township 11, E.C.M. (Fraser drainage.)

Salmon River.—Now called Nahatlatch river.

Salmon River.—A rather important river flowing into Shuswap lake [illegible] Salmon Arm. For complete description and hydrographic data see River Station [illegible] Salmon river. (Shuswap lake-South Thompson drainage.)

Saw-mill Creek.—A small tributary of Fraser river from the west, in township 7-26-6. (Fraser drainage.)

Saw-mill Creek.—A very small tributary of Fraser river, in township 14-27-6. (Fraser drainage.)

Schedam Creek.—Now called Paul creek. (Q.V.)

Sekkam Creek and Lake.—A very small tributary of Fraser river, in township 5-26-6. (Fraser drainage.)

Scotch Creek.—A tributary of Shuswap lake from the north, in township 22-11-6. Drainage area 360 square miles. (Shuswap-South Thompson drainage.)

Scotch Creek.—A small tributary of Incomappleux river from the west, 3 miles from Cambourne. (Incomappleux-Columbia drainage.)

Scottie Creek.—A tributary of Bonaparte river from the east, in township 23-25-6. Used for irrigation. For hydrographic data see River Station on Scottie creek. (Bonaparte-Thompson drainage.)

Scuittoe Creek.—A tributary of Campbell lake, in township 18-16-6. (Campbell-South Thompson drainage.)

Scuittoe Lake.—Emptying into east fork of Campbell creek, in township 18-16-6.

Scuzzy Creek.—A tributary of the Fraser river from the west, in township 10-26-6. The drainage area is 90 square miles. Small power possible. (Fraser drainage.)

Sedge Lake.—A small lake in the hills to the east of Deadman river, in township 22-21-6.

Semmihault Creek.—A tributary of Fraser river, in township 26, E.C.M. (Fraser drainage.)

Separating Lake.—A small lake in section 34, township 20-23-6.

Separation Lake.—Empties into Anderson creek, thence into Campbell creek, in township 19-17-6. (Campbell-South Thompson drainage.)

Serpentine River.—Flows into Boundary bay in township 1, W.C.M. (Fraser drainage.)

Seven Mile Creek.—Now called Inkikuh creek.

Seventeen Mile Creek.—A small tributary of Fraser river from the east, in township 9-26-6. (Fraser drainage.)

Seymour Arm.—The most northerly arm of Shuswap lake.

Seymour River.—Flows into Seymour arm of Shuswap lake from the north. (Shuswap lake-South Thompson drainage.)

Sherbrooke Creek.—A small stream flowing into Kicking Horse river from the north, in township 28-17-5, about 1 mile west of Hector, B.C. Small power possibilities. (Kicking Horse-Columbia drainage.)

Sherbrooke Lake.—An enlargement of Sherbrooke creek in section 6, township 29-17-5. Good storage.

Shumway Lake.—A lake about 2 miles long, in township 18-17-6, discharging into Campbell creek. (Campbell-South Thompson drainage.)

Shuswap Lake.—A large lake at the head of the South Thompson river. (South Thompson drainage.)

Shuswap River.—A large river rising in Mabel lake and flowing into Shuswap lake at Sicamous. For hydrographic data see River Station on Shuswap river. (Shuswap lake-South Thompson drainage.)

Sibbalds Creek.—A small tributary of Columbia river, in township 23-2-6, near Revelstoke. (Columbia drainage.)

Silver Creek.—Now called Silver Hope creek.

Silver Creek.—A tributary of Harrison lake, in township 7-29-6. (Harrison-Fraser drainage.)

Silver Creek.—Now called Silver Pitt creek.

Silver Creek.—A tributary of Salmon river, in township 19-10-6. On August 22, 1911, discharge was 3.5 c. f. s. (Salmon-Shuswap lake-South Thompson drainage.)

Silver Creek.—A tributary of Illecillewaet river from the north, in township 25-28-5. Timber and possibly mining. (Illecillewaet-Columbia drainage.)

Silverdale Creek.—A small stream flowing into Fraser river from the north, in township 17, E.C.M. (Fraser drainage.)

Silver Hope Creek.—A tributary of Fraser river from the south, in township 5-26-6, near Hope. Timber and small power. For hydrographic data see River Station on Silver-Hope creek. (Fraser drainage.)

Silver Hope Lake.—An enlargement of Silver Hope creek, in township 4-26-6.

Silver Pitt Creek.—A small stream flowing into Pitt river from the west, just at the outlet of Pitt lake. Small industrial power development is possible. The town of Coquitlam also has this stream under consideration for civic water supply. (Pitt-Fraser drainage.)

Siwash Creek.—A very small tributary of Fraser river from the east, in township 13-27-6. (Fraser drainage.)

Siwash Creek.—A very small tributary of Fraser river from the east, in township 7-26-6. (Fraser drainage.)

Siwash Creek.—A tributary of Tulameen river, in township 6-23-6.

Siwhe Creek.—A small tributary of Fraser river from the west, in township 17-27-6, above Lytton. (Fraser drainage.)

Sixmile Creek.—Now called Bolean creek.

Sixmile Creek.—A tributary of Beaver river from the west, in township 29-25-5. Timber and mining. (Beaver-Columbia drainage.)

Skackan Creek.—A tributary of Nicola river, in township 15-24-6. (Nicola-Thompson drainage.)

Skimikin Lake.—At the head-waters of Granite creek, in section 24, township 21-12-6. (Granite-Shuswap lake-South Thompson drainage.)

Skookumchuck Creek.—A very small tributary of Guichon creek, at its head-waters in township 19-22-6. (Guichon-Nicola drainage.)

Skoonka Creek.—A small tributary of Thompson river from the west, in township 16-25-6. Water diverted into Botanic lake for irrigation purposes. (Thompson drainage.)

Skuhost Creek.—A small tributary of Skuhun creek, in township 16-23-6. (Skuhun-Nicola drainage.)

Skuhun Creek.—A tributary of Nicola river from the east, in township 15-24-6; very little agricultural land up the valley. Discharge, on September 16, 1911, was 5·5 c.f.s. (Nicola-Thompson drainage.)

Skuppa Creek.—A small tributary of Fraser river from the east, in township 14-27-6. (Fraser drainage).

Skwellepil Creek.—A small tributary of Chehalis lake, in township 6-1-7. (Chehalis-Harrison-Fraser drainage.)

Skwowolt Creek.—A small tributary of Fraser river, in township 5-27-6. (Fraser drainage.)

Sleetsis Creek.—A small tributary of Thompson river from tho west, in township 16-25-6. (Thompson drainage.)

Slesse Creek.—A tributary of Chilliwack river from the south, in township 1-28-6. (Chilliwack-Sumas-Fraser drainage.)

Slick Creek.—A small stream flowing into Incomappleux river, in township 25-26-5. (Incomappleux-Columbia drainage.)

Slollicum Creek (Slollicum, meaning wraith).—A small mountain stream, with beautiful wraith-like falls, flowing into Harrison lake, in township 5-28-6. (Harrison-Fraser drainage.)

Sluckamin Creek.—A small tributary of Fraser river from the west, in township 13-26-6. (Fraser drainage.)

Snohoosh Lake.—Now called Deadman lake.

Snowshoe Creek.—A small tributary of Silver creek, in township 9-29-6. (Silver-Harrison-Fraser drainage.)

Sodalite Creek.—A tributary of Ice river, in township 25-18-5. Ice-Beaverfoot-Kicking Horse-Columbia drainage.)

Soucah Creek.—A small tributary of Fraser river from the east, in township 6-26-6. (Fraser drainage.)

South Pass Creek.—A small stream flowing into Three Valley lake, in township 23-4-6. (Eagle-Shuswap lake-South Thompson drainage.)

South Thompson River.—Rises in Shuswap lake and joins the North Thompson river at Kamloops. See hydrographic data on South Thompson river. (Thompson drainage.)

Spa Creek.—A small tributary of Salmon river from the west, in township 18-10-6. (Salmon-Shuswap lake-South Thompson drainage.)

Spallumcheen Lake.—A small lake in township 17-10-6 in the Okanagan divide.

Spallumcheen River.—Now called Shuswap river. (Q.V.)

Spanish Lake.—A small lake at the head of Warren creek, in township 18-11-6. (Warren-Salmon drainage.)

Speyum Creek.—A small tributary of Fraser river from the west, in township 11-26-6. (Fraser drainage.)

Spillimacheen River.—A large tributary of Upper Columbia river from the west, 40 miles south of Golden. Timber, mining and undeveloped power. For complete description see hydrographic data on Spillimacheen river. (Upper Columbia drainage.)

Spinster Creek.—A small tributary of Gold creek, in township 31-27-5. (Gold-Columbia drainage.)

Spius Creek.—(Also called Petit creek.) An important tributary of Nicola river from the south, in township 14-23-6. Near Canford. Timber irrigation and possibly small power. For hydrographic data see River Station on Spius creek. (Nicola-Thompson drainage.)

Split Creek.—A small tributary of Blaeberry river, in township 29-21-5. (Blaeberry-Columbia drainage.)

Sproat Creek.—A tributary of Columbia river, in township 21-29-5, south of Revelstoke. (Columbia drainage.)

Spuzzum Creek.—A tributary of Fraser river from the west, in township 8-26-6. Timber and small power. (Fraser drainage.)

Squianny Creek.—A small tributary of the Thompson river from the east, in township 16-25-6. (Thompson drainage.)

Stacey Creek.—A small tributary of Upper Columbia river from the east, near section 30, township 26-21-5. (Upper Columbia drainage.)

Stadia Creek.—A tributary of Chehalis river, in township 6-1-7.

Stake Lake.—A small lake at the head of Meadow creek, in township 18-18-6. (Meadow-Guichon-Nicola drainage.)

Starvation Creek.—A tributary of Tulameen river, in township 7-22-6. (Tulameen-Similkameen, etc,. drainage.)

Statlu Creek.—Tributary of Chehalis river from the west, in township 4-30-6; Chehalis river used to be called Statlu, but this name is now given to the west fork.

On November 2, 1911, the discharge was 40 c.f.s. (Chehalis-Harrison-Fraser drainage.)

Stave Lake.—A lake some 8 miles long and from 2 to 3 miles wide at the head of Stave river. Important for logging and storage for power.

Stave River.—An important river flowing into Fraser river from the north, near Ruskin. There are two good power sites, one of which (the upper) has been developed by the Western Canada Power Co. Hydrographic investigations of Stave river havo been made hy the Western Canada Power Co. for a period of years. The timber interests on Stave river, also are considerable. (Fraser drainage.)

Steelhead Creek.—Local name of Cascade creek, a small tributary of Stave river.

Steelhead Creek.—A small stream flowing into Morris river, in township 4-29-6. (Morris-Harrison-Fraser drainage.)

Steep Creek.—A tributary of Beaverfoot river in township 25-19-5. (Beaverfoot-Kicking Horse-Columbia drainage.)

Stein Creek.—An important tributary of Fraser river from the west, in township 15-27-6 just above Lytton. Irrigation and undeveloped power. For hydrographic data see River Station on Stein creek. (Fraser drainage.)

Stewart Creek.—A tributary of Sumas lake from the east, in township 22, E.C.M. (Sumas-Fraser drainage.)

Stinking Lake.—A small lake emptying into Eight-mile creek, in township 21-23-6. (Eight-mile-Thompson drainage.)

Stony Creek.—A mountain stream flowing into Beaver river from the west, in township 28-25-5. (Beaver-Columbia drainage.)

Stoyoma Creek.—A small tributary of Fraser river from the east, in township 11-26-6. Small undeveloped power. (Fraser drainage.)

Stryen River.—A tributary of Stein creek, in township 15-27-6. (Stein-Fraser drainage.)

Stulkawhist Creek.—A small tributary of Fraser river from the west, in township 6-26-6. (Fraser drainage.)

Sturgeon Slough.—Draining into Pitt river, in township 40, E.C.M. (Pitt-Fraser drainage.)

Succour Creek.—A tributary of Bush river, near its mouth, in township 32-26-6. (Bush-Columbia drainage.)

Sucker Creek.—A small tributary of Coquihalla river, in township 5-26-6. (Coquihalla-Fraser drainage.)

Suicide Creek.—A small tributary of Fraser river from the north, in township 20, E.C.M.

Sullivan Creek.—Small irrigation stream flowing into North Thompson river from the east, in township 22-17-6. See hydrographic data. (North Thompson drainage.)

Sumallow River.—Rises in township 3-24-6 and flows southerly into Skagit river, thence across the international border into United States.

Sumas Lake.—A lake of some 9,000 acres on the south side of Fraser river in Sumas district. The lake is tidal and flooded during the high water season of Fraser and Chilliwack rivers. The Sumas dyking project is to dyke and drain Sumas lake and the surounding country. (Sumas-Fraser drainage.)

Sumas River.—A tributary of Fraser river from the south, in township 20, E.C. M. (Fraser drainage.)

Western Canada Power Co. Stave River Dam and Power House.

Summit Creek.—A small tributary of Shuswap river from the west, in township 19-9-6. (Shuswap-South Thompson drainage.)

Summit Lake.—A lake of about 400 acres, in township 18-14-6, and used as a storage reservoir for irrigation, some of the water of Monte creek being diverted into it. The lake discharges through Essell creek, and is used in Grand Prairie. (Essell-Salmon-Shuswap lake-South Thompson drainage.)

Summit Lake.—A small lake at Eagle pass, in township 23-3-6, flowing into the Eagle river. (Eagle-Shuswap lake-South Thompson drainage.)

Summit Lake.—A small lake at 'The Great Divide,' in township 29-17-5. (Kicking Horse-Columbia drainage.)

Sunbeam Lake.—A small mountain lake (elevation 6,500 feet) draining into Spinster creek, in township 30-26-5. (Spinster-Gold-Columbia drainage.)

Surprise Creek.—A small mountain stream flowing into Beaver river from the west, in township 28-25-5. (Beaver-Columbia drainage.)

Sweltzer Creek.—Rises in Cultus lake and flows into the Chilliwack river, in township 22, E.C.M. See hydrographic data on Sweltzer creek.

Takakkaw Falls.—Flowing into the Yoho river from the east, in township 29-18-5, 12 miles north of Field. A sheer fall of 1,250 feet from Daly glacier. Important for its scenic beauty. (Yoho-Kicking Horse-Columbia drainage.)

Tallon Creek.—A tributary of Beaverfoot river, in township 25-19-5. (Beaverfoot-Kicking Horse-Columbia drainage.)

Tamihi Creek.—A tributary of Chilliwack river, in township 25, E.C.M. (Chilliwack-Sumas-Fraser drainage.)

Ten-mile Creek.—Now called Guichon creek.

Thompson River.—One of the largest and most important rivers in British Columbia, flowing into the Fraser river at Lytton. For complete description and hydrographic data see River Station on Thompson river. (Fraser drainage.)

Three-mile Creek.—An irrigation stream flowing into Kamloops lake from the south, in township 21-21-6. See miscellaneous measurements on Three-mile creek. (Thompson drainage.)

Three Valley Lake.—A small lake, being an enlargement of Eagle river, in township 23-4-6; timber interests. (Eagle-Shuswap lake-South Thompson drainage.)

Tikwalus Creek.—A small tributary of Fraser river from the west, in township 9-26-6. (Fraser drainage.)

Tobacco Creek.—A tributary of Deadman river, in township 23-22-6. (Dead--man-Thompson drainage.)

Toby Creek.—A large tributary of Upper Columbia from the west, just below lake Windermere. Timber, irrigation and power. For complete description and hydrographic data see River Station on Toby creek. (Upper Columbia drainage.)

Tokumm Creek.—A tributary of Vermilion river, in township 26-16-5, thence into the Kootenay.

Tonkawatla River.—A tributary of Columbia river from the west, in township 23-2-6, near Revelstoke, also called Tum Tum river. (Columbia drainage.)

Town Creek.—A small stream flowing into the northeast arm of Upper Arrow lake, opposite Beaton. (Columbia drainage.)

Tranquille Lake.—A small lake near the head-waters of Tranquille river, in township 23-19-6.

Tranquille River.—An irrigation stream flowing into Kamloops lake from the north, in township 20-19-6. For hydrographic data see River Station on Tranquille river. (Thompson drainage.)

Takakkaw Falls, Yoho Valley.

Trapp Lake.—A small lake near the head-waters of Campbell creek, in township 17-17-6. Storage for irrigaton. (Campbell-South Thompson drainage.)

Trinity Creek.—A small tributary of Shuswap river, from the south, in township 18-7-6. (Shuswap-South Thompson drainage.)

Trout Lake.—A small lake near the east shore of Harrison lake, in township 4-28-6. (Harrison-Fraser drainage.)

Trout Lake.—In township 17-19-6, about 20 miles south of Kamloops; also called Fish lake. (Q.V.)

Trout Lake Creek.—A small stream from Trout lake flowing into Harrison lake, in township 4-26-6. (Harrison-Fraser drainage.)

Tsileuh Creek.—A tributary of the Fraser river from the west, in township 9-26-6. (Fraser drainage.)

Tskinakin Creek.—A tributary of Adams lake from the southeast, in township 25-12-6. (Adams-Shuswap lake-South Thompson drainage.)

Tsotin Lake.—A small lake up Eight-mile creek, in township 21-23-6. (Thompson drainage.)

Tsuius Creek.—A tributary of Mabel lake from tho east, in township 19-5-6. (Shuswap-South Thompson drainage.)

Tulameen River.—Rises in township 4-23-6, near the south limit of the Railway Belt, and discharges into Similkameen river outside the Railway Belt.

Tum Tum River.—Now called Tonkawatla river.

Tunkwa Lake.—Also called Big lake, in township 19-21-6, at the head of the west fork of Three-mile creek. Water is diverted from Guichon creek into Tunkwa lake, there stored and conducted down Three-mile creek for irrigation purposes. (Thompson drainage.)

Twaal Creek.—An irrigation stream flowing into Thompson river from the west, just above Spences Bridge, in township 17-25-6. See miscellaneous measurements on Twaal creek. (Thompson drainage.)

Twaal Lake.—A very small lake near the head-waters of Twaal creek, in township 18-25-6.

Twelve-mile Creek.—A small tributary of Upper Columbia river from the west, in township 26-21-5. (Upper Columbia drainage.)

Twenty-mile Creek.—A small tributary of Harrison lake, in township 7-29-6. (Harrison-Fraser drainage.)

Twenty-two Mile Creek.—Locally called Paddys creek, a small irrigation stream flowing into Upper Columbia river from the east, in township 27-20-5. (Upper Columbia drainage.)

Twenty-eight Mile Creek.—A small tributary of Upper Columbia river from the east, near the south limit of the Railway Belt. The discharge on July 15, 1912, was 0·6 c.f.s. (Upper Columbia drainage.)

Twig Creek.—A tributary of Salmon river above Grand Prairie, in township 16-14-6. (Salmon-Shuswap lake-South Thompson drainage.)

Twilight Creek.—A tributary of Six-mile creek, in township 30-26-5. (Six-mile Beaver-Columbia drainage.)

Twin Creeks.—Two small streams flowing into Illecillewaet river from the south, in township 24-29-5, about 10 miles east of Revelstoke. (Illecillewaet-Columbia drainage.)

Twin Lakes.—A storage reservoir in section 25, township 20-23-6, storing the diverted waters of Barnes creek, thence to British Columbia Horticultural Estate. Area, 80 acres. Capacity of 1,200 acre-feet.

Ustlius Creek.—A tributary of Anderson river, in township 10-25-6. (Anderson-Fraser drainage.)

Van Horne Creek.—A small mountain stream flowing into Incomappleux river, in township 25-26-5. (Incomappleux-Columbia drainage.)

Vedder River.—A small stream flowing into Sumas lake from the east, in township 23, E.C.M., and through which the whole body of Chilliwack river now flows. (Sumas-Fraser drainage.)

Venables Creek.—An irrigation stream flowing into Thompson river from the west, in township 18-24-6. See hydrographic data on River Station on Venables creek. (Thompson drainage.)

Venables Lake.—A small storage lake in Venables creek, in township 18-25-6.

Vermilion River.—A tributary of Kootenay river, rising in the Railway Belt, in township 25-16-5. (Kootenay drainage.)

Victor Lake.—A small lake in Eagle Pass, near Clanwilliam, B.C., in township 23-3-6. Timber pondage. (Eagle-Shuswap lake-South Thompson drainage.)

Viola Creek.—Flows into Coquitlam lake from the east, 2 miles from outlet of lake, in township 5-6-7. On October 26, 1912, discharge was 258 c.f.s. (Coquitlam-Fraser drainage.)

Vulcan Creek.—A small stream flowing into Pitt lake from the east, in township 5-4-7. (Pitt-Fraser drainage.)

Wahleach Creek.—Now called Jones creek, in township 4-27-6. (Q.V.)

Waitabit Creek.—A tributary of Columbia river from the north, in township 29-23-5 at Donald. (Columbia drainage.)

Walker Creek.—A small stream in township 13, E.C.M.

Wap River.—Also called Frog creek (Mabel lake.) (Q.V.)

Warmspring Creek.—A small tributary of Upper Columbia river from the east, in township 23-18-5. On July 15, 1912, the discharge was 2·0 c.f.s. (Upper Columbia drainage.)

Warren Creek.—Also called Ferris creek, an irrigation stream flowing into Salmon river in section 36, township 17-12-6. See hydrographic data on River Station on Warren creek. (Salmon-Shuswap lake-South Thompson drainage.)

Warren Creek.—A small tributary of middle fork of Spillimacheen river, in township 23-20-5. (Spillimacheen-Upper Columbia drainage.)

Washout Creek.—A tributary of Upper Columbia river from the east, in township 25-21-5. See miscellaneous measurements on Washout creek. (Upper Columbia drainage.)

Watching Creek.—A tributary of Tranquille river from the east, in township 21-19-6. (Tranquille-Thompson drainage.)

Waterfall Creek.—A small tributary of Beaver river from the west in township 27-25-5. (Beaver-Columbia drainage.)

Weaver Creek.—A tributary of Morris river, in township 4-29-6. (Harrison-Fraser drainage.)

Weaver Lake.—A small lake at the head of Weaver creek.

Welcome Lake.—A small lake in township 38, W.C.M. (Fraser drainage.)

Wentworth Lake.—A lake near the head of Jamieson creek, used by British Columbia Fruitlands Company as a storage reservoir. (Jamieson-North Thompson drainage.)

White Creek.—A small creek flowing into Salmon Arm from the north, in township 21-10-6, near Twappen. On October 6, 1911, the discharge was 1·8 c.f.s. (Salman Arm-Shuswap lake-South Thompson drainage.)

White Lake.—A lake 3 miles long at the head of White creek, in township 22-10-6.

Whitepine Creek.—A tributary of Bluewater creek, in township 30-24-5. (Bluewater-Columbia drainage.)

Whiterock Creek.—A tributary of Venables creek, in township 19-25-6. (Venables-Thompson drainage.)

Whonock Creek.—A small tributary of Fraser river from the north, in township 14, E.C.M. (Fraser drainage.)

Whonock Lake.—A small lake in section 17, township 15, E.C.M., discharging into Whonock creek.

Willowbank Creek.—A small tributary of Blaeberry river from the west, in township 29-22-5. (Blaeberry-Columbia drainage.)

Witch Creek.—A tributary of Guichon creek from the west, in township 18-21-6. For hydrographic data see River Station on Witch creek. (Guichon-Nicola-Thompson drainage.)

Wolf Lake.—A small lake in township 18-16-6, flowing into Scuittoe creek. (Campbell-South Thompson drainage.)

Woodland Creek.—A tributary of Scuittoe creek, in township 18-15-6. (Campbell-South Thompson drainage.)

Woods Creek.—A small tributary of Pukaist creek, in township 18-24-6. (Pukaist-Thompson drainage.)

Woods Creek.—A tributary of Salmon river above Grand Prairie, in township 17-14-6. (Salmon-Shuswap lake-South Thompson drainage.)

Woods Lake.—At the head of Woods creek, in township 17-14-6.

Wright Lake.—A small lake emptying into Hunakwa lake, in township 25-7-6. (Anstey Arm-Shuswap lake-South Thompson drainage.)

Yale Creek.—A tributary of Fraser river, in township 7-26-6, at Yale. Timber, municipal water supply and small power. (Fraser drainage.)

Yard Creek.—A tributary of Eagle river, 10 miles from the mouth, in township 22-7-6. (Eagle-Shuswap lake-South Thompson drainage.)

Yawnak Creek.—A small tributary of Fraser river from the west, in township 16-27-6, above Lytton. (Fraser drainage.)

Yoho River.—An important tributary of Kicking Horse river from the north, in township 28-18-5. Important for its scenic beauty, mining and small power. For complete description and hydrographic data see River Station on Yoho river.

Yolo Creek.—A small tributary of Silver Hope creek, in township 3-26-6. (Silver Hope-Fraser drainage.)

Young's Creek.—Now called Greenstone creek. (Q.V.)

Young Creek.—A tributary of Brandt creek, thence of Mesliloet river from the east, in township 6-7-7; timber and small industrial power. On October 20, 1912, the discharge was 11·4 c.f.s. (Brandt-Mesliloet drainage.)

Young Lake.—A small lake at the head of Young creek.

Zinc Creek.—A tributary of Ice river, in township 26-18-5. (Ice-Beaverfoot-Kicking Horse-Columbia drainage.)

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MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)

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Base Map from plates of Map of Canada
Geographer's Branch, Dept. of the Interior.

Water Power Branch, Dept. of the Interior
To accompany Report, Railway Belt Hydrographic Surveys.


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Six Miles to one Inch.
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To accompany Report, Railway B[illegible] [illegible]rographic Surveys.

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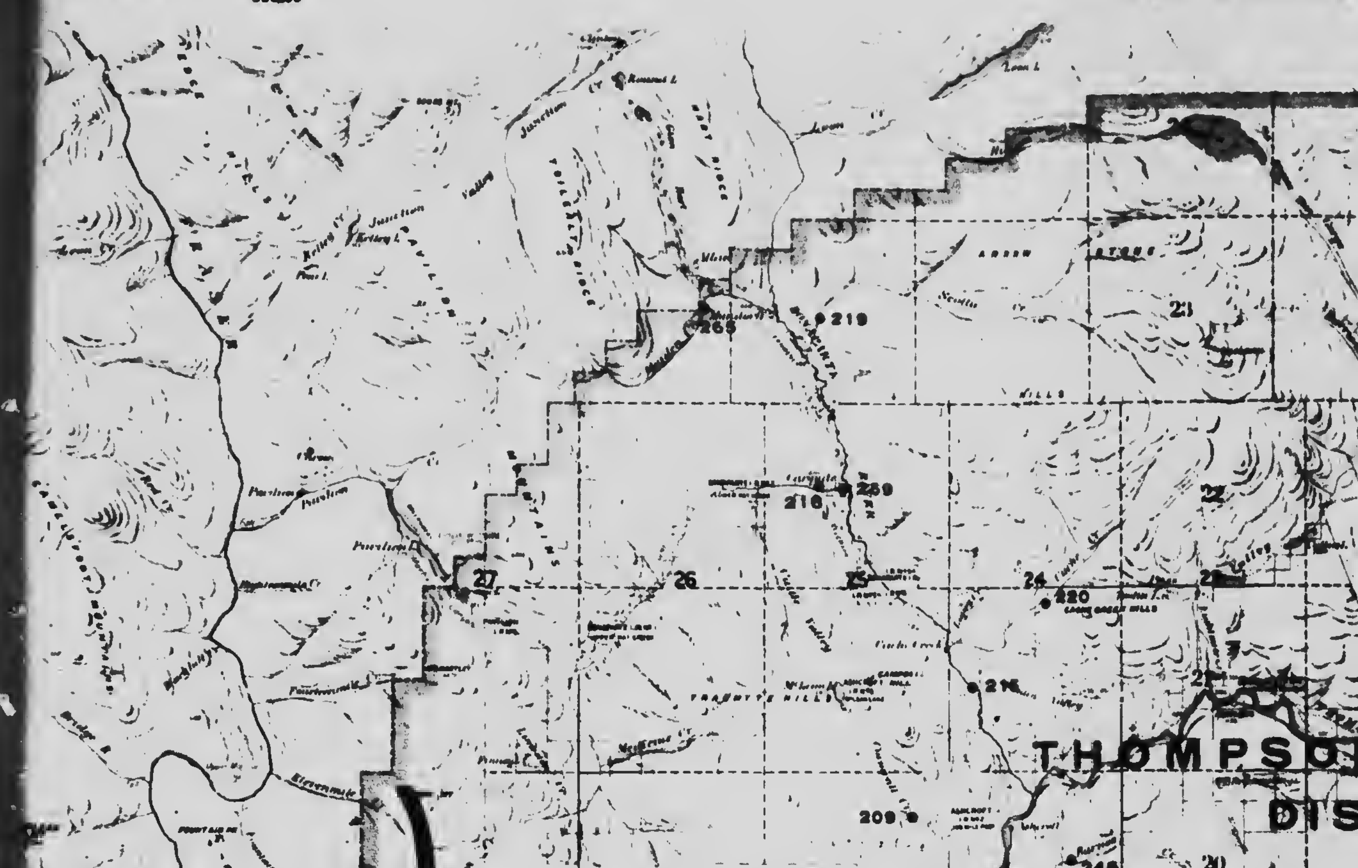

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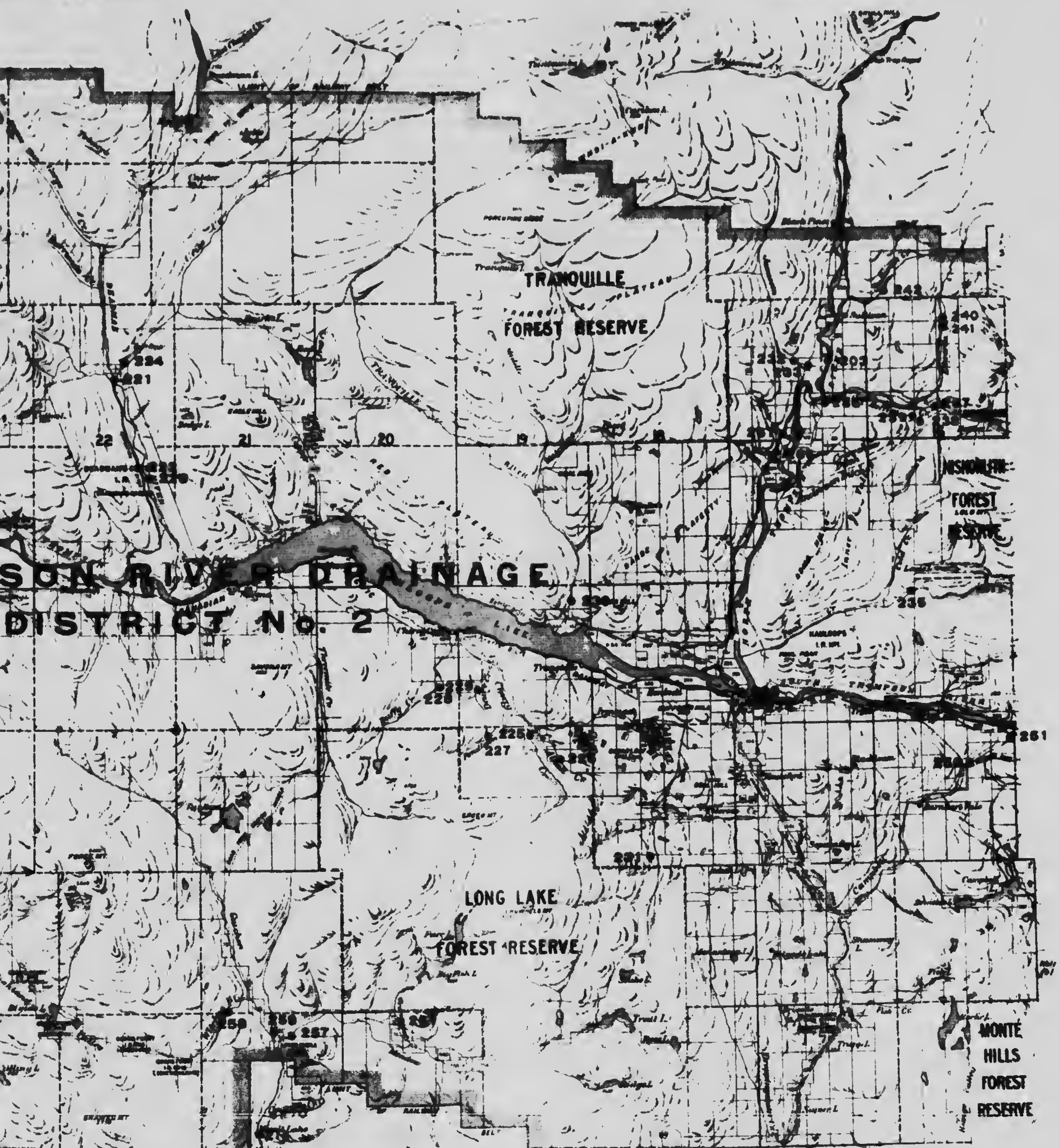

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To accompany Report, Railway Belt Hydrographic Surveys.

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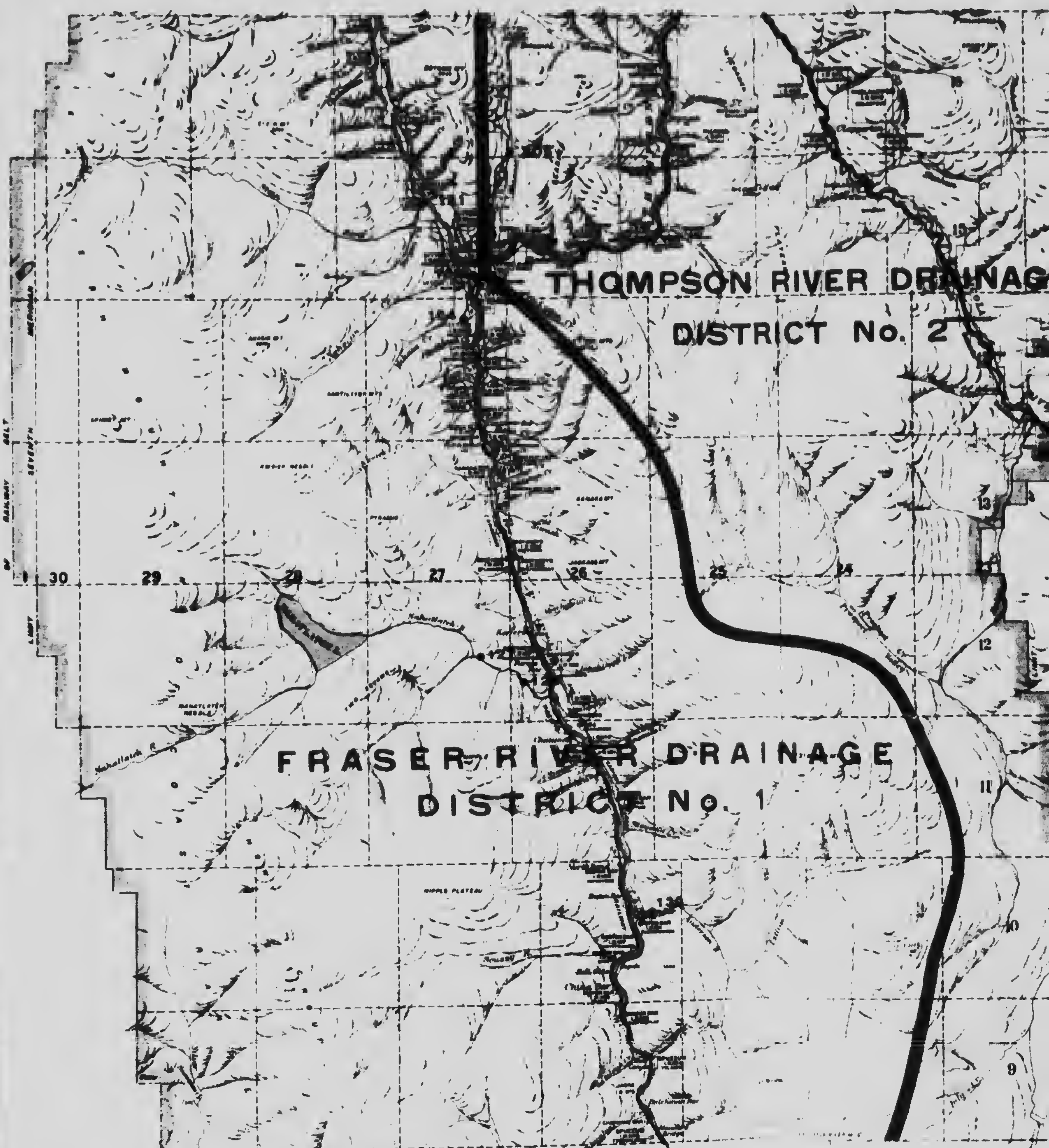

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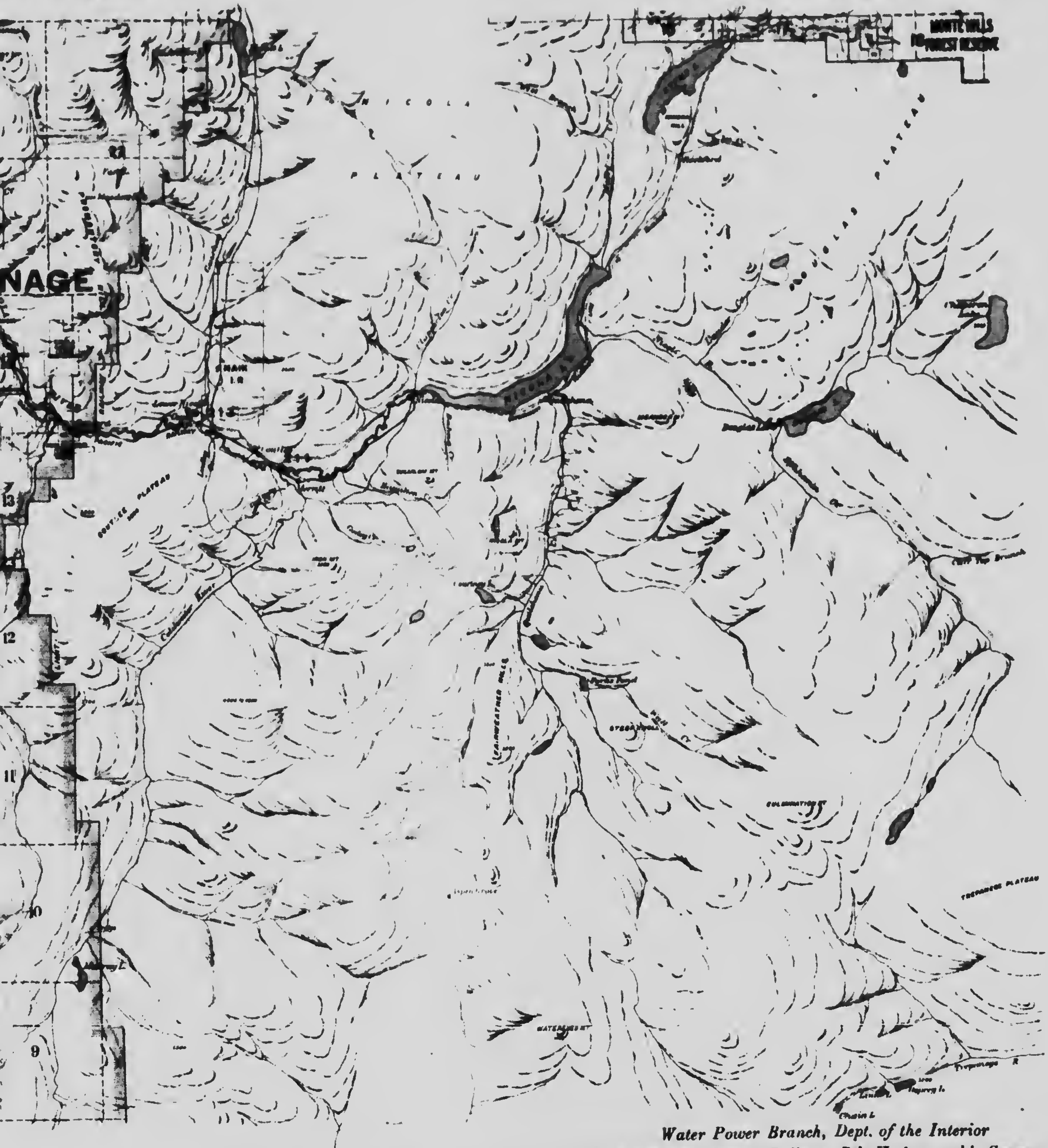

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To accompany Report, Railway Belt Hydrographic Surveys.

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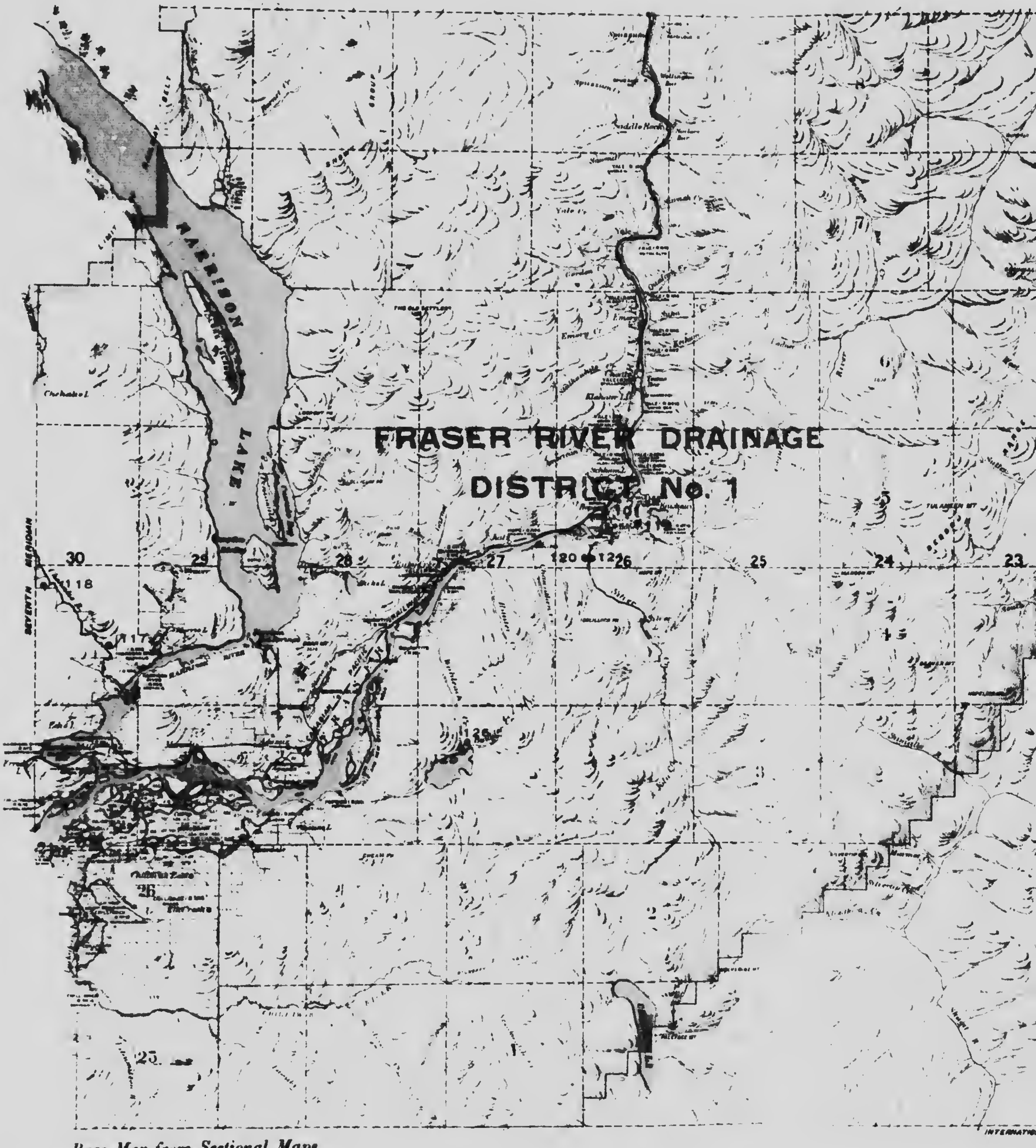

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To accompany Report, Railway Belt Hydrographic Surveys.

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