ANNUAL REPORT

OF THE

MINISTER OF LANDS

OF THE PROVINCE OF

BRITISH COLUMBIA

FOR THE

YEAR ENDING 31ST DECEMBER

1920

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1921.

VICTORIA, B.C., February 5th, 1921.

To His Honour WALTER CAMERON NICHOL,

Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

Herewith I beg respectfully to submit the Annual Report of my Department for the year ending December 31st, 1920.

T. D. PATTULLO,

Minister of Lands.

VICTORIA, B.C., February 5th, 1921.

The Honourable T. D. Pattullo,
Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit the Annual Report of the Department of Lands for the twelve months ending December 31st, 1920.

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

G. R. NADEN,
Deputy Minister of Lands.

PART I.

DEPARTMENT OF LANDS.

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DEPARTMENT OF LANDS.

REPORT OF OFFICE STATISTICS.

VICTORIA, B.C., February 3rd, 1921.

G. R. Naden, Esq.,
Deputy Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit the Annual Report of the Lands Branch of the Department of Lands for the year ending December 31st, 1920, containing a summary of the administration of Crown lands in the Province. The various statements herewith are self-explanatory and show clearly the business done under the "Land Act" in the shape of pre-emptions, purchases, and leases granted and dealt with, and also transactions under the "Coal and Petroleum Act," as well as the cash receipts brought to account in the Department.

In addition, there is a statement of the applications completed under the "Townsite Proportionate Allotment Act." The administration of this Act has entailed considerable correspondence and taken up a great deal of time of a portion of the office staff during the past year.

Considerable advancement has also been made towards winding up all the land transactions under the "Soldiers' Homestead Act." A number of these, however, are of such a complicated nature as to render their completion very difficult, but it is expected that the final adjustments under this Act will be made in a short time.

Steps have also been taken towards closing outstanding agreements in connection with town lots and subdivided lands disposed of at auction during the past several years, and in respect to which the payments are still in arrear. Notice calling for payment has been published in compliance with section 70 of the "Land Act," following which individual notices have been sent out to delinquent purchasers before final action is taken.

Following the tax sales of 1918 and 1919, certificates of forfeiture have been filed in the Department by the various Assessors throughout the Province, containing lists of the lands which have reverted to the Crown for unpaid taxes, consisting of district lots and subdivisions of all kinds in all parts of British Columbia.

Quite a number of sales have been made of these forfeited lands during the year, and numerous adjustments have been made in connection with repurchases by former owners and the cancellation and setting-aside of erroneous and incorrect forfeitures.

I have, etc.,

H. CATHCART,
Superintendent of Lands.

PRE-EMPTION RECORDS, ETC., 1920.

Agency.	Pre-emption Records.	Certificates of Improvement.	Certificates of Purchase.
Alberni	21	3	18
Atlin	....	1	1
Cariboo	240	48	163
Cranbrook	20	16	10
Fernie	1	1	3
Fort Fraser	381	27	50
Fort George	388	27	58
Golden	5	3	7
Kamloops	35	12	13
Lillooet	101	42	77
Nanaimo	1	4	10
Nelson	17	11	8
New Westminster	3	8	10
Nicola	24	33	42
Omineca	124	19	89
Osoyoos	14	3	24
Peace River	3	....	....
Revelstoke	....	....	1
Similkameen	32	26	29
Skeena	49	12	36
Slocan	21	....	20
Stikine	....	....	....
Vancouver	115	26	68
Victoria	14	5	428
Yale	15	1	2
Totals	1,624	328	1,067

LAND-SALES, 1920.

	Acres.
Surveyed (first class)	1,690
" (second class)	26,633.2
	28,323.2
Unsurveyed	6,054
Total	34,377.2

CROWN GRANTS ISSUED, 1920.

Pre-emptions	443
"Pre-emptors' Free Grants Act"	396
Purchase	122
Mineral	283
"Soldiers' Homestead Act"	150
Town lots	118
Reverted lands	174
Reverted mineral	43
Townsite Proportionate Allotment Act"	16
"Dyking Assessments Act"	6
Miscellaneous	11
"Schools Act"	4
Land settlement	23
Soldier Settlement Board	38
Crown grants written up	1,827
Applications for Crown grants	2,014
Certified copies of counterfoils	7

Total Acreage deeded.

Pre-emptions	131,457.77
Mineral	8,180.22
Surveyed	30,475.30
Unsurveyed	45,251.21
Total	215,364.50

REPORT ON COAL LICENCES, LEASES, ETC., 1920.

Coal-prospecting Licences.

Number of licences issued, 275; area, 126,500 acres.

Coal Leases.

Number of leases issued, 12; area, 7,680 acres.

Sundry Leases.

Number of leases issued, 113; area, 12,761 acres.

PRE-EMPTIONS INSPECTED IN 1920.

Alberni	...
Atlin	...
Cariboo	44
Cranbrook	42
Fernie	7
Fort Fraser	224
Fort George	409
Golden	1
Kamloops	24
Lillooet	24
Nanaimo	...
Nelson	16
New Westminster	5
Nicola	9
Omineca	139
Osoyoos	20
Peace River	...
Revelstoke	3
Similkameen	72
Skeena	113
Slocan	10
Stikine	...
Vancouver	169
Victoria	6
Yale	8
Total	1,345

STATEMENT OF REVENUE.

	Under "Land Act."								Under "Coal and Petroleum Act."							
Months.	Land-sales.	Rent of Land.	Survey Fees.	Crown-grant Fees.	Lease Fees.	Certificates of Improvement.	Pre-emption Records.	Royalty.	Licence Fees.	Lease Rentals.	Lease Fees.	Penalty.	Lieu of Work.	Maps, Blue-prints, etc	Miscellaneous.	Total.
January	$20,283 05	$2,417 82	$ 38 50	$1,575 00	$45 00	....	$ 2 00	....	$3,262 50	$1,056 00	$40 00	....	$ 262 50	$ 651 40	$ 82 40	$29,716 17
February	2,999 98	7,200 35	50 00	490 00	55 00	....	2 00	....	5,700 00	72 00	.....	....	450 00	383 45	34 79	17,437 57
March	4,724 05	5,348 55	120 50	1,375 00	10 00	....	2 00	....	6,419 49	5,749 33	10 00	$25 00	400 00	514 35	170 40	24,868 67
April	10,260 65	2,602 81	155 10	800 00	90 00	....	....	....	2,300 00	14,235 32	5 00	....	150 00	396 25	29 72	31,024 85
May	9,960 38	3,738 65	272 00	1,130 00	40 00	....	....	....	1,700 00	10,335 15	10 00	....	....	602 90	27 90	27,816 98
June	23,034 23	5,837 37	80 00	2,445 00	80 00	$ 2 00	2 00	....	900 00	2,966 78	10 00	....	150 00	388 93	166 46	36,062 77
July	11,298 85	2,994 69	161 00	1,445 00	45 00	2 00	....	....	3,600 00	459 60	.....	....	100 00	249 93	27 05	20,383 12
August	6,078 55	2,928 39	58 25	1,420 00	25 00	4 00	....	$142 65	800 00	1,320 00	.....	....	350 00	262 40	66 80	13,456 04
September	13,508 97	3,608 14	9,861 75	1,070 00	25 00	....	....	....	2,500 00	2,263 78	.....	....	200 00	242 47	44 15	33,324 26
October	28,858 45	1,609 60	1,261 85	1,225 00	25 00	....	....	303 25	2,700 00	6,677 82	15 00	25 00	200 00	429 38	20 07	43,350 42
November	9,081 06	3,082 99	30 65	2,020 00	100 00	....	....	....	1,400 00	1,484 05	.....	....	100 00	567 12	19 15	17,885 02
December	120,341 86	2,263 47	.....	1,815 00	70 00	2 00	....	....	2,100 00	5,808 14	.....	....	100 00	233 10	372 20	133,105 77
Totals	$260,430 08	$43,632 83	$12,089 60	$16,810 00	$610 00	$10 00	$ 8 00*	$445 90	$33,381 99	$52,427 97	$90 00	$50 00	$2,462 50	$4,921 68	$1,061 09	$428,431 64

*Ten pre-emption records issued free to returned Soldiers.

SUMMARY.

	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.
Pre-emption records	1,535	1,620	2,049	2,383	3,655	3,855	4,304	2,277	1,167	824	823	1,752	1,624
Certificates of improve't.	256	289	439	624	715	962	1,002	665	465	541	379	326	328
Certificates of purchase	2,438	4,363	9,031	7,141	5,065	3,640	1,805	990	729	778	592	747	1,067
Crown grants	1,667	1,714	1,572	2,566	2,737	2,110	1,376	718	847	1,167	1,512	1,806	1,827
Total acreage deeded	253,541.95	326,229.54	300,587.79	524,325.99	253,143.60	390,036.32	245,244.78	75,225.00	98,452.00	187,111.64	260,321.40	512,844.87	215,364.50
Coal prospecting licences.	479	692	145	2,223	2,003	1,090	545	198	120	71	72	112	275
Sundry leases	36	83	92	121	47	46	51	38	86	73	83	51	113
Coal leases	.....	.....	.....	.....	75	207	71	29	31	7	3	1	12
Cash received	$3,065,164.43	$4,148,403.44	$3,190,416.21	$3,526,544.61	$2,525,497.29	$946,944.23	$589,687.36	$126,308.28	$159,213.65	$194,435.17	$369,392.51	$251,471.25	†$428,431.64
Letters received	33,629	25,798	37,188	41,946	43,302	31,738	30,287	19,151	13,779	15,780	22,500	*53,835	32,180
Letters sent	.....	.....	.....	23,568	21,612	17,305	14,790	10,104	8,432	12,632	12,500	18,063	19,912

*This includes total letters received by entire Department. † Cash received at Victoria only.

APPLICATIONS COMPLETED UNDER THE "TOWNSITE PROPORTIONATE ALLOTMENT ACT."

	Lots completed.	Lots resumed.	Amount transferred.	Cash received.	Amount forfeited.
Prince Rupert	19	8	$42,224 60	$67 20	$2,365 00
Prince George / Fort George	7	28	3,924 77	29 25	43 98
Point Grey	11	12	7,747 11	1,206 35	54 61
Stewart Townsite	7	40	15,040 70	570 35	9 30
Tulameen	5	19	516 25	164 45	....
Totals	49	107	$69,453 43	$2,037 60	$2,472 89

REPORT OF THE SUPERINTENDENT OF BRITISH COLUMBIA SOLDIER SETTLEMENT.

VICTORIA, B.C., February 10th, 1921.

G. R. Naden, Esq.,
Deputy Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit herewith summary of operations for the year 1920 under the "Soldiers' Land Act," chapter 80 of the Statutes of British Columbia, 1918, amended by chapter 76, 1919, and chapter 85, 1920; and the "Better Housing Act," chapter 8 of the Statutes of British Columbia, 1919.

"SOLDIERS' LAND ACT."

Surveys and construction have been actively continued throughout the year. Detailed topographical surveys of the project have now been completed and the plan of subdivision worked out for the whole area. The Townsite of Oliver has been laid out and upwards of 3,000 acres north and south of it have been posted on the ground.

Excavation of the main canal has been completed and the necessary concrete culverts constructed for about 12½ miles. The diversion-dam, concrete lining of the main canal and siphons have been completed for about 8 miles, with some structural work for flumes beyond and the flume-metal delivered.

A concrete-lined main lateral over 4 miles in length up the west side of the valley above the Townsite of Oliver has, with the exception of a short length of pipe and flume, been completed.

The Okanagan River has been rediverted to its original channel at a point about 3 miles above the townsite, and the surface level of Tuculnuit Lake lowered about 3 feet, with the consequent drainage of adjacent low lands, while drainage-ditches have been opened for other low-lying areas.

Distribution-works are in progress and a cement-pipe plant has been installed and is operating.

The lumber required for camps, timber structures, forms, and general construction has been supplied by a sawmill built and operated at a point about 11 miles east of Oliver. The total cut has been 2,922,000 feet B.M., of which 613,000 feet is in stock.

The labour conditions have been much as they were in 1919. Every effort was made to get a sufficient number of men for the work, but not until fall was this accomplished.

The total expenditure on the whole project works to December 31st was $1,403,521.78.

The nursery and demonstration plot has been visited by many prospective settlers during the year. Excellent results have been obtained from the French stock which arrived last spring, and also from local apricot-seed. This should enable the nursery to have approximately 17,000 fruit-trees of the best commercial varieties of proved bearing qualities acclimatized to the district and available for the settlers next spring. Of this number, 8,000 seedlings were obtained from France and the balance were raised from local seed, all of which have been budded during the past season. Twenty thousand seedlings have been ordered again from France for delivery this spring.

The total expenditure on the nursery and demonstration plot to December 31st was $21,900.49.

It is expected that as the nursery stock matures, with corresponding increase in value, and the propagation of larger quantities of young stock will now be possible without further overhead expenditures or increase in acreage, together with economy in operating costs of the water-supply, it should be possible to show a credit balance after another season's work.

SOUTH VANCOUVER HOUSING.

It is satisfactory to report that of the eight houses built under chapter 80, Statutes of 1918, "Soldiers' Land Act," with the exception of a month's arrears in one instance, all are in good standing.

AREAS OF LAND CONVEYED TO THE SOLDIER SETTLEMENT BOARD OF CANADA.

The following lands have been reserved and conveyed to the Soldier Settlement Board of Canada for soldiers who have applied for loans to the Board:

Cariboo District.—Lot 1123, Bk. B; Lot 1554, Frac. N.E. ¼; Lot 1554, S.E. ¼; Lot 2915, S.W. ¼; Lot 3183, N.W. ¼ Lot 3797, S.E. ¼; Lot 3802, S.W. ¼; Lot 3958, N.E. ¼; Lot 3964; Lot 3982, S.W. ¼; Lot 4630, S. ½ of S. ½; Lot 5304, Frac. N.E. ¼; Lot 6124, S.E. ¼; Lot 6134, Frac. S. ½; Lot 7196, Frac. S.E. ¼; Lot 8003, S.W. ¼; Lot 8006, Bk. B; Lot 8284, W. ½; Lot 8286, N. ½; Lot 8664; Lot 9331, N. ½.

Coast District, Range 4.—Lot 693, W. ½.

Coast District, Range 5.—Lot 707, N.E. ¼; Lot 1116; Lot 2006; Lot 2030, W. ½; Lot 4230, E. ½; Lot 4235; Lot 4556, S.W. ¼; Lot 5698, S. ½.

Kamloops District.—Lot 752-L; Lot 4282.

Kootenay District.—Lot 7696, S. ½.

Lillooet District.—Lot 2841, Frac. N.W. ¼; Lot 4088, S.W. ¼; Lot 4509; Lot 4640.

New Westminster District.—Lot 4821, Gp. 1.

Osoyoos District.—W. ½ of N.E. ¼, Sec. 4, and W. ½ of S.E. ¼, Sec. 9, Tp. 6.

Otter District.—Lot 28, Bk. A; Lot 28, Bk. B.

Yale District.—Lot 975.

"BETTER HOUSING ACT."

Total amount of allotment to British Columbia from Dominion Government, $1,361,521.59.

Municipality.	Amount advanced.	Number of Houses alread erected.	Number of Houses in course of erection.	Number of Houses proposed to be erected in Addition to the Foregoing	Number of Applications for $300 Rebates in Good Standing.	Amount of Rebates to be granted.
Burnaby	$ 25,500	6	2	..	8	$ 2,400
Courtenay	35,000	3	4	4	..	.....
Duncan	3,500	1	..	..	1	300
Esquimalt	21,000	6	3	..	6	1,800
Kamloops	60,000	17	.	..	17	5,100
Kelowna	25,800	..	..	..	8	2,400
Langley	10,500	..	..	..	3	900
Matsqui	2,000	1	..	..	1	300
Nanaimo	30,000	9	..	..	9	2,700
New Westminster	60,000	17	..	..	16	4,800
North Vancouver (City)	65,000	19	4	..	18	5,400
North Vancouver (District)	74,500	..	..	..	14	4,200
Oak Bay	16,450	5	..	..	5	1,500
Penticton	23,000	8	..	..	..	.....
Point Grey	94,000	20	1	2	11	3,300
Port Alberni	7,000	..	2	1	..	.....
Port Coquitlam	11,200	3	1	..	4	1,200
Prince George	51,000	..	..	..	7	2,100
Prince Rupert	100,000	38	..	..	..	.....
Saanich	44,000	14	..	..	14	4,200
Salmon Arm	3,500	1	..	..	1	300
South Vancouver	90,000	34	..	..	20	6,000
Trail	15,000	3	1	2	4	1,200
Vancouver	300,000	80	8	..	88	26,400
Vernon	20,000	4	2	2	..	.....
Victoria	140,000	23	10	5	27	7,800
West Vancouver	25,000	..	2	5	..	.....
Totals	$1,354,750	312	40	21	291	$83,300

I have, etc., J. W. CLARK,
Superintendent, B.C. Soldier Settlement.

PART II.

SURVEY BRANCH.

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REPORT OF THE SURVEYOR-GENERAL.

January 1st, 1921.

To the Hon. T. D. Pattullo,
Minister of Lands, Victoria, B.C.

SIR,—I have the honour to submit the following report on the operations of the Survey Branch of the Department of Lands for the year ending December 31st, 1920:—

The appropriation for Crown land surveys for the fiscal year ending March 31st, 1921, was $231,000 as compared with $110,000 for the previous year. This increase has permitted the Branch to carry out during the past season the most extensive survey programme since the beginning of the war.

Weather conditions unfortunately during the season were somewhat abnormal. After a late spring July and August were unusually hot months, and the fly and mosquito pests were reported extremely annoying from many points in the Interior of the Province. September, which is usually the month depended upon to furnish ideal weather conditions for surveying operations, this year proved to be an extraordinarily wet month throughout the whole Province, and the field-work was consequently considerably retarded. The remainder of the season, however, was comparatively favourable.

Owing to the high cost of equipment, supplies, labour, and transportation, it was recognized that survey costs for the year would be greater than any previous year. In order to keep these costs at a minimum it was decided in the spring to depart somewhat from the methods of organization followed in previous years by arranging stronger parties for a longer season, thus reducing as much as possible the relative overhead charges. In some instances a qualified land surveyor was appointed as assistant in order to permit the surveyor in charge to cruise ahead of the party, laying out the work to best advantage, and finding the original corners of previously surveyed lands, thus preventing any delay in the actual line-work.

A total number of fifty-three duly qualified British Columbia land surveyors were employed during the season for various periods, sixteen of whom were acting as assistants. Of these, forty were men who had served in the Army during the late war.

The responsibility of employing labourers and other assistants was, as usual, left with the surveyors in charge. They were instructed, however, in all cases to co-operate as much as possible with the Provincial Government Labour Bureau and to give a preference to returned soldiers.

CROWN LAND SURVEYS.

The area of Crown land surveyed totals 124,927 acres. Of this, about 50 per cent. was alienated as unsurveyed pre-emptions prior to the amendment of the "Land Act" in 1918 permitting the pre-emption of surveyed land only. Practically all the land so alienated has now been surveyed, including, as far as is known, all but a very few of the outstanding pre-emptions held by returned soldiers, who are, under the provisions of the "Pre-emptors' Free Grants Act," entitled to free grants to the lands so held.

The total number of lots surveyed was 872; 153 being pre-emptions held by returned soldiers, 236 pre-emptions held by others than soldiers, and 454 parcels of vacant Crown lands which will be available for settlement when the surveys are accepted.

Certain logged-off and expired timber licences were subdivided on the Coast, in the Coast and Sayward Districts, and at Powell River.

In the vicinity of Powell River the areas of the parcels range from 20 to 40 acres, according to the nature of the soil and the proximity to transportation. In the portions of this area adjacent to the Pulp Company's property a further subdivision into 1-acre parcels has recently been made. Approximately 165 lots of this size have been laid out, and the surveyor is now engaged in laying out some thirty or forty 5-acre parcels in the same locality. It is expected that this work will be completed in a couple of weeks. These parcels, it is anticipated, will be in active demand as home-sites, and it is hoped to have the surveys completed and accepted at an early date, so that the reserve covering same can be cancelled and the lands made available for occupation.

A number of squatters are already in occupation of various portions of this area and in some instances have made valuable improvements.

One of the problems of the Branch has always been the difficulty of obtaining in convenient form for reference detailed and authentic information with regard to the physical characteristics and suitability for different agricultural and other purposes of the various parcels surveyed. During the past year special instructions were issued to all Government surveyors to make a more systematic examination of all lands surveyed by them, and to furnish the results of such examination on a special form provided for this purpose.

The results obtained by this departure appear to be highly satisfactory, as the surveyors have invariably responded very ably, and a large amount of valuable information has been collected in a form which will make it much more readily available to the interested public.

After the surveys are gazetted, the tracing of the official plan sent to the Government Agent for the district in which the land is situated will be accompanied by a copy of the form containing the surveyor's description, and in this way information as to the nature of any particular parcel will be available at the local land offices. A sample copy of this form filled out accompanies this report as Appendix A.

Owing to what may be termed the "individual lot system of survey" existing in this Province, it is necessary, in order to properly correlate all surveys for mapping and other purposes, to carry out, as conditions warrant, what are known to this office as control surveys. These may be divided into three different classes, viz.:—

(1.) Traverses between individual isolated lots or groups of lots. These are usually made along a road, trail, shore-line, or generally along the lines of least resistance.

(2.) Base-lines, usually run along a parallel of latitude, a meridian of longitude or some district boundary-line.

(3.) Triangulation surveys. This is the most accurate method of establishing control, but in the Interior, where triangulation stations are necessarily on the tops of the mountains, it is usually difficult and expensive to make connection between the triangulation survey and the land surveys which are in the valleys. On the British Columbia coast-line, however, presenting innumerable channels and inlets, triangulation stations can be established on the shore-line and an accurate and inexpensive means of control effected.

During the past season 556 miles of traverses were run. This work is generally incidental to the usual lot-survey work, as it is the aim of the Branch to definitely tie in all new lots, and also to tie in previously surveyed unconnected lots which may be situated in the localities covered by our parties.

Base-line surveys were rather extensively carried on several years ago, but owing to decreased survey appropriations during the war this work had to be postponed.

During the past season one party was employed in running the 55th parallel of latitude, forming the boundary between Coast District, Range 5, and Cassiar District; 39 miles of this line were established between the 124th meridian and Middle River. The line runs through territory previously more or less unexplored, and the surveyors' reports on this work contain a considerable amount of new geographical and other data.

Two parties were employed for the season on the continuation of the triangulation of the Coast channels and inlets. One other party was employed part of the season on this class of work. In all, 667 miles of coast-line were so surveyed. This net of triangulation now extends from Smith Inlet, near the north end of Vancouver Island, to the north end of Grenville Channel, or within 15 miles of the mouth of the Skeena River, and including all the main inlets. All existing surveys en route have been tied in to the triangulation.

A special form of monument was designed in the spring to perpetuate the more prominent and important triangulation stations. These consist of a ¾-inch iron bar 10 inches long squared 6 inches from the top, on one of the square faces of which the number of the station is stamped with a die. The lower portion of the bar is split to permit the insertion of a steel wedge by means of which the bar is securely driven into a 1-inch hole 5 inches deep drilled into rock. A cairn of rocks is built over the post; thus a conspicuous and convenient point of reference with which to connect future surveys. These monuments are, where possible, erected in such a manner that at least two may be intervisible, so that a surveyor may readily determine bearings as well as position, provided he is in possession of a copy of the triangulation plan.

In addition to the above, 160 miles of Quesnel and Cariboo Lakes and 170 miles of triangulation ties in the vicinity of the 53rd parallel were established.

By arrangement with Dr. Otto Klotz, Chief Astronomer of the Department of the Interior, Ottawa, astronomical determinations of latitude and longitude were made at Squamish, Sechelt, Merritt, Lardeau, and Windermere. The stations thus established were tied to adjacent land surveys and in this manner the geographic positions of these surveys determined for mapping purposes.

Acknowledgment is also due to the officials of the Geodetic Survey and the Geological Survey for furnishing information in connection with the geodetic and trigonometric work undertaken by them in the Province.

FIELD-WORK.

For the purpose of reporting on the work done by the various parties, the Province has been divided into the following main sections, viz.: Central and Northern Interior; Southern Interior-Dry Belt; Southern Interior-Kootenay District; Mainland Coast and Vancouver Island.

The following paragraphs give the names of the surveyors in charge of the various parties and the locality and nature of the work done by them in the various sections:—

Central and Northern Interior.

The term "Central and Northern Interior" is applied to that portion of the Province lying north of the Dominion Government Railway Belt and east of the Coast range of mountains.

The following surveyors were engaged in this section of the Province:—

Surveyor.	Locality.
R. P. Bishop	55th parallel of latitude.
V. Schjelderup	Coast, Ranges 4 and 5.
J. F. Campbell	Fraser Valley, vicinity of Prince George.
A. R. Barrow	Peace River District.
E. J. Gook	Fraser Valley, vicinity of Quesnel.
R. W. Haggen	Quesnel and Cariboo Lakes.
W. C. Merston	Nazko and Chilcotin Valleys.
G. R. Bagshawe	Vicinity of 150-Mile House.
W. S. Drewry	North-eastern Lillooet District.
G. M. Downton	Southern Lillooet District.
J. E. Ross	Deadman River Valley.

Mr. Bishop's party was engaged on the survey of the 55th parallel of latitude, forming the boundary between Coast, Range 5, and Cassiar Districts. The remaining parties were engaged on the survey of vacant Crown lands for settlement and unsurveyed pre-emptions. In addition to this, Mr. Campbell subdivided a number of lots in the vicinity of Prince George which reverted to the Crown under the "Soldiers' Homestead Act." Mr. Haggen made a triangulation survey of Cariboo Lake and a portion of Quesnel Lake.

Southern Interior-Dry Belt.

In that portion of the Province lying south of the Dominion Railway Belt, including portions of the Kamloops and Yale Divisions and all of the Similkameen and Osoyoos Divisions of Yale District, survey operations were carried on by surveyors in charge of the following surveys:—

Surveyor.	Locality.
O. B. N. Wilkie	Nicola Valley.
P. W. Gregory	Vicinity of Princeton.
A. E. Humphries	Similkameen and Ashnola Valleys.
C. Æ. Shaw	Vicinity of Keremeos.
A. P. Augustine	Southern Okanagan Valley.
J. C. Agnew	Vicinity of Lumby.
R. C. Farrow	Main Kettle and West Fork Rivers.
A. H. Holland	Vicinity of Grand Forks.

All of these men were engaged on the survey of land for pre-emption purposes, either as vacant Crown land for future settlement or land already held under record. Messrs. Farrow and Holland made extensive cruises in the blocks included in the Columbia and Western Land

Grant, and repurchased by the Crown in 1912. All areas found to be suitable were surveyed into lots for settlement purposes, and these lots will be available for entry as soon as the surveys are plotted and gazetted and the reserve now covering them is cancelled. It was found that these blocks in general did not contain any very large areas of agricultural land. Such as was found consisted of small patches and usually widely scattered. They do contain, however, extensive areas of good grazing land which are far from being utilized.

Southern Interior-Kootenay District.

The following surveyors were in charge of parties in the Kootenay District:—

Surveyor.	Locality.
H. H. B. Abbott	Arrow Lakes.
W. J. H. Holmes	Slocan Lake and South-west Kootenay District.
L. F. Grant	Upper Columbia Valley.
J. T. Laidlaw	Vicinity of Cranbrook.

The work of these parties was confined chiefly to the survey of existing pre-emptions and adjacent vacant Crown lands suitable for settlement.

Mr. Laidlaw also subdivided a number of logged-off and expired timber licences. In addition to the above, A. H. Green and H. D. Dawson were employed for a few weeks each on scattered surveys in the vicinity of Kootenay Lake.

Mainland Coast.

Surveyor.	Locality.
J. A. Walker	New Westminster District.
G. K. Burnett	Vicinity of Powell River.
H. M. T. Hodgson	Lasqueti Island.
John Davidson	Sayward District.
John Elliott	Range 1, Coast District.
T. H. Taylor	Vicinity of Fisher Channel.
J. T. Underhill	Gardner Canal and vicinity.
A. E. Wright	Grenville Channel and vicinity.
F. C. Swannell	Eutsuk Lake and Kimsquit.

Mr. Walker's party was organized by H. H. Roberts, who was obliged to quit field-work on account of ill-health. The work of this party consisted of a number of control triangulations and traverses on Howe Sound and the survey of scattered pre-emptions in New Westminster District. Messrs. Davidson and Elliott surveyed pre-empted land in various sections of the Coast and subdivided logged-off timber licences.

Hr. Hodgson completed the resurvey of Lasqueti Island, commenced last year, and made a few small surveys on Texada Island.

Mr. Burnett was employed on the subdivision of logged-off lands in the vicinity of Powell River and Lang Bay. These lands are from an agricultural standpoint probably the most desirable of any vacant lands on the Coast. The area is extensive, thus ensuring the prospective settler of community advantages in the future. The climatic conditions are good, the rainfall being considerably less than at Vancouver. The district would appear to be particularly suitable for truck-gardening and small-fruit growing. Experiments with tree-fruits are apparently successful, and when a sufficient amount of land is cleared and brought under cultivation to provide feed, dairying should prove a profitable occupation. As previously stated, these lands have been divided into 40-acre tracts, and those in closer proximity to Powell River into 20-acre parcels. Immediately adjoining the Pulp Company's property a number of 1-acre and 5-acre home-sites have been surveyed.

Messrs. Taylor, Underhill, and Wright were employed on triangulation-work, while Mr. Taylor also surveyed a number of pre-emptions in the vicinity of Namu and Bella Bella.

Mr. Swannell established a tie by triangulation and traverse between the western extremity of the survey of the 53rd parallel and the triangulation of Dean Channel at Kimsquit, carrying on at the same time a reconnaissance survey of the areas traversed. His report and map when completed will convey a considerable amount of new information regarding this district previously only slightly explored.

Vancouver Island.

Surveyor.	Locality.
F. E. Leach	Barclay and Clayoquot Districts.
J. H. Gray	Rupert District.

Mr. Leach was employed on miscellaneous surveys on the west coast of Vancouver Island, while Mr. Gray surveyed a few scattered pre-emptions in Rupert District during the latter part of the season.

PHOTO-TOPOGRAPHICAL SURVEYS.

During the season of 1919 the photo-topographical survey of the entire watershed of Okanagan Lake and Okanagan River between the south boundary of the Railway Belt and the 49th parallel of latitude was completed. This work was commenced in 1914 and the field-work was confined to one party each season under the direction of R. D. McCaw, B.C.L.S.

The results obtained have been very satisfactory and the maps produced have been found to be of great value, especially in the administration of the Water Rights and Grazing Branches. It was accordingly decided to carry on this class of work more vigorously during the season of 1920, and two parties were organized—one in charge of Mr. McCaw, who worked in the area drained by the headwaters of the Nicola River, and G. J. Jackson, B.C.L.S., who covered portions of the drainage areas of the Ashnola and Similkameen Rivers. The total area covered by surveys and of which maps are now being prepared is approximately 585 square miles.

When it was decided to organize the additional party it became necessary to obtain two new surveying cameras, which are of special design and construction and manufactured only to order. Inquiries sent to manufacturers in London, England, elicited the information that they could not be obtained in time for use during the past surveying season. A camera of the latest design was thereupon obtained from the Surveyor-General of Dominion Lands, and with this as a pattern two instruments were manufactured in Victoria by local craftsmen, which have proved entirely satisfactory. It is interesting also to note that the total cost of the instruments was slightly less than the London quotation.

ALBERTA-BRITISH COLUMBIA BOUNDARY.

The Interprovincial Boundary Commission, consisting of A. O. Wheeler, the British Columbia Commissioner, and R. W. Cautley, representing both the Dominion and Alberta Governments, continued work during the year. Mr. Wheeler's surveys were confined to the mapping of that portion of the boundary between Fortress Lake and a point south of Yellowhead Pass.

Mr. Cautley ran 43½ miles of the 120th meridian, running south from a point about 12 miles south of Swan Lake to the intersection of the line with the Wapiti River.

This work is being carried on by an agreement between the Governments of the Provinces of Alberta and British Columbia and the Dominion, each Government bearing one-third of the cost.

SURVEYORS' REPORTS.

General reports prepared by the various surveyors employed during the season are appended to this report.

PRIVATE SURVEYS.

Surveys of Crown lands made at the instance of and paid for by private parties, such as surveys of pre-emptions, applications to purchase or lease, coal licences, timber licences, mineral claims, etc., are known departmentally as "private surveys." During recent years private surveys have been chiefly confined to the survey of timber licences and mineral claims. There are indications, however, that in future there will be an increasing number of applications to purchase and lease, and that surveys of this nature will again increase.

Under the "Forest Act" the time for the survey of timber licences expired on December 31st, 1920. Contrary to expectations, the number of licences surveyed during the past year was less than in 1919, field-notes of only 435 licences having been received, as against 525 received during the previous year. If the Legislature extends further relief during the coming session, it is estimated that there are still nearly 1,900 licences which might be renewed and which are still unsurveyed.

There has been a steady increase from year to year since 1914 in the receipt of mineral-claim surveys; during 1920 field-notes of 432 claims were received, compared with 259 in 1919. This would indicate a healthy growth in the mineral industry of the Province.

OFFICE-WORK.

The office staff is divided into two main divisions—viz., the Survey Division and the Geographic Division. Very few changes have taken place in the personnel of the Survey Division during the year, but additional men were added to the staff of the Geographic Division to take up the work of the standard base map.

Both divisions have been able to increase their output of work to a considerable extent, as shown by the reports of the Chief Draughtsman and Chief Geographer, hereto attached.

I have the honour to be,
Sir,
Your obedient servant,
J. E. UMBACH,
Surveyor-General.

APPENDIX A, SURVEYOR-GENERAL'S REPORT.

SAMPLE SURVEYOR'S REPORT ON EXAMINATION OF LOT 888, S.E. ¼, YALE DIVISION, YALE DISTRICT, 29 ACRES.

DATE OF SURVEY, June 15th to 24th, 1920.

Timber.—The merchantable timber on this parcel is confined to about 7 acres, being fir up to 36 inches diameter and yellow pine and running about 3,000 feet per acre.

Surface.—The surface consists of gently sloping land.

Soil.—Sandy loam and black loam 18 inches deep.

Vegetation.—The land is well covered with grass, with here and there patches of peavine and vetch. There are clumps of poplar, willow, and alder scattered throughout.

Water.—A small creek about 2½ feet wide flows near the south-west corner and across this parcel.

Roads.—A wagon-road passing near the east boundary of this parcel and running northerly connects with the highway to Princeton, about half a mile distant.

Location.—Situated about 10½ miles by road from Princeton in a south-westerly direction, and on the slopes adjoining the west bank of the Similkameen River.

Elevation.—About 3,400 to 3,500 feet above sea-level by barometer.

General.—About 15 acres of this parcel could be cultivated; the remainder affords good pasture. It is bounded on the east by a group of surveyed mineral claims.

P. W. GREGORY, B.C.L.S.

REPORT OF THE CHIEF DRAUGHTSMAN.

December 31st, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the work of the Survey Division for the year ending December 31st, 1920:—

OFFICE-WORK.

As in previous years, the majority of the work done has consisted of the examination and acceptance of the field-notes of the surveys of Crown lands throughout the Province, together with the preparation of new departmental reference maps, and the clearance of all land applications and Crown grants. There has been a considerable expansion in nearly all the branches of the work, as will be seen from the following tables. In addition, the work in connection with the issuance of instructions for surveys, both to surveyors employed by the Department and also to private surveyors, has largely increased, and includes the preparation of plans and field-notes for the use of surveyors in the field.

FIELD-NOTES.

During the year 1,117 field-books were received, as against 1,090 received during 1919. The various surveys contained in these field-books consist of 799 land lots, 432 mineral claims, 435 timber licences, and 102 traverse connections or triangulations.

During the same period 1,598 lot surveys were plotted and found to be in order. Notice of their acceptance duly appeared in the Gazette. Tracings of these lots were prepared and forwarded to the respective Government Agents.

The following table gives an analysis of the acreage of the various kinds of surveys gazetted during the year:—

	Acres.
Pre-emption surveys	8,172
Purchase surveys	5,992
Mineral-claim surveys	12,580
Timber-licence surveys	347,729
Coal-licence surveys	22,143
Lease surveys	3,227
Government surveys	63,505
Total	463,348

A comparison of these figures with those of previous years, as far back as 1900, may be found by reference to Table A attached to this report.

The acreage of timber-licence surveys gazetted during the year shows a large increase over that of the previous year, as is also the case in connection with coal and oil surveys, while the total acreage is nearly double that of last year.

TIMBER SURVEYS.

Field-notes covering the survey of 435 licences were received during the year, as compared with 525 during 1919. It is estimated that of the timber licences in good standing or renewable (provided the Statute is amended), 11,568 have been surveyed, leaving 1,871 still unsurveyed.

RIGHT-OF-WAY PLANS.

The examination of the plans of railway rights-of-way, logging-railways and pole-lines has been carried on as heretofore.

It is estimated that during the year 220 miles of Grand Trunk Pacific Railway right-of-way plans were examined and finally cleared for Crown-granting purposes. In addition, before Crown-granting the plan of each lot crossed by a railway has been examined in order that such right-of-way may be properly deducted or included, as the case may be.

CLEARANCES.

As in previous years, clearance reports have been furnished by this Branch on all applications for lands dealt with by the Lands Department. These include 1,624 applications for pre-emption, 351 applications to purchase, 275 coal licences, 113 miscellaneous leases, 2,014 Crown-grant applications, together with 959 timber-sales and 325 hand-logger licences.

DEPARTMENTAL REFERENCE MAPS.

The work of keeping these maps up to date and compiling new ones has been actively carried on. Ten maps were recompiled and drawn on projection, while three were retraced.

INFORMATION SUPPLIED TO SURVEYORS AND OTHERS.

A nominal charge is made for the preparation of copies of field-notes, blue-prints, etc., required by surveyors and others. The revenue derived for the copying of field-notes is included in the amount of $1,373.70 received for photostat (*see* Chief Geographer's report), while the sum of $2,037.70 was paid in for the prints. It is calculated that over 11 miles of blue-print paper was used during the year.

The following is a statement of the number of blue-prints made:—

Mail and counter orders	2,074
Surveyor-General's Branch	2,268
Forest Branch	12,473
Other branches of Government service	11,963
Sundry	1,603
Total	30,381

There were also prepared 1,827 tracings (in duplicate) to be attached to Crown grants and 96 tracings (in duplicate) to accompany land leases.

CORRESPONDENCE AND ACCOUNTS.

During the year 6,261 letters were received and 5,007 sent out, which includes inter-departmental memoranda.

Accounts amounting to $229,490.10 have been checked and dealt with by the Accountant.

Table B attached to this report gives a summary of the office-work for the year 1920 and comparative figures for 1919.

GENERAL.

There has been practically no change during the year in the personnel of the staff, the number employed in this Division being twenty-two, which is the same as at the beginning of the year. Of these, eight are men who served overseas during the war, and it is a source of great satisfaction to me to be able to report that without exception the manner in which they have readjusted themselves to the sedentary routine work of the office is most commendable, especially from the fact that draughting involves closer and more tedious application than the usual office-work.

A list of departmental reference maps is attached to this report as Table C.

I have, etc.,

F. O. MORRIS,

Chief Draughtsman.

APPENDIX TO REPORT OF CHIEF DRAUGHTSMAN.

TABLE A.—SHOWING ACREAGES OF EACH CLASS OF SURVEYS GAZETTED EACH YEAR SINCE 1900.

Year.	Pre-emptions.	Purchases.	Mineral Claims.	Timber Limits.	Coal Licences.	Leases.	B.C. Govt. Surveys.	Totals.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1900	22,873	4,419	33,441	59	.....	664	10,057	71,513
1901	26,493	16,401	33,400	2,027	.....	593	.....	79,094
1902	35,297	29,652	31,057	1,040	626	1,026	.....	98,698
1903	37,615	26,787	18,115	127,992	.....	2,003	800	213,312
1904	48,124	36,468	20,549	155,279	48,670	3,009	179	312,278
1905	42,660	58,705	15,535	214,841	137,218	806	107	469,872
1906	33,573	66,668	9,894	77,829	41,312	9,566	.....	238,842
1907	50,460	162,218	10,017	83,016	20,367	4,387	113,968	444,433
1908	66,788	147,980	14,607	167,925	9,821	2,580	97,072	506,773
1909	71,316	145,325	10,744	426,121	8,310	15,239	512,373	1,189,428
1910	79,273	455,356	12,499	509,201	43,363	5,864	302,536	1,407,912
1911	89,485	1,352,809	21,325	686,909	120,938	6,500	948,644	3,226,610
1912	99,461	1,011,934	16,645	804,730	99,236	8,560	826,362	2,866,997
1913	55,202	508,062	18,043	1,181,355	72,719	4,740	1,014,366	2,854,487
1914	45,551	234,580	7,546	1,105,635	36,098	4,209	1,078,579	2,512,198
1915	22,746	41,551	8,339	512,628	29,245	841	705,170	1,320,520
1916	14,335	8,771	7,677	302,903	10,983	5,145	124,953	474,767
1917	12,632	802	8,386	275,538	2,843	2,960	111,256	414,417
1918	10,835	1,634	9,247	223,768	953	2,342	60,311	309,090
1919	8,514	153	10,264	165,289	160	1,495	77,121	262,996
1920	8,172	5,992	12,580	347,729	22,143	3,227	63,505	463,348

Table B.—Summary of Office-work for the Year 1920 and Comparative Figures for 1919.

	1919.	1920.
Number of field-books received	1,090	1,117
„ lots surveyed	1,049	1,231
„ lots gazetted and tracings forwarded to Government Agents	1,174	1,598
„ miles of right-of-way plans dealt with	435	220
„ applications for purchase cleared	76	351
„ applications for pre-emption cleared	1,752	1,624
„ reference maps compiled	4	13
„ Crown-grant applications cleared	1,806	2,014
Total number of letters received by Branch	3,938	6,261
„ „ Crown-grant and lease tracings made in duplicate	1,956	1,923
„ „ blue-prints made	20,432	30,381
Total revenue from sale of blue-prints	$2,161.85	*$2,037.70

Table C.—Departmental Reference Maps.

Price-list of Blue-prints.

		Scale.	Price.
1.	West Coast, V.I. (Barkley Sound, Southerly)	1 inch to 1 mile	$1 00
1A.	West Coast, V.I. (Barkley Sound, Northerly)	„ „	1 00
2.	West Coast, V.I. (Nootka District)	„ „	1 00
3.	Belize and Seymour Inlets and Smith Sound	„ „	1 00
3A.	Quatsino Sound and West Portion of Rupert District	„ „	1 00
3B.	Gilford, Cracroft, and Broughton Islands	„ „	1 00
3C.	Nimpkish River Valley and Lake	„ „	1 00
3D.	Central Portion of Rupert District	„ „	1 00
4.	Knight, Bute, and Loughborough Inlets	„ „	1 00
4A.	Sayward District, Thurlow, Valdes, and Redonda Islands and Powell Lake and Toba Inlet	„ „	1 00
5.	Texada Island and West Portion, New Westminster District	„ „	1 00
5A.	Jervis and Sechelt Inlets	„ „	1 00
5B.	Howe Sound and Cheakamus River Valley	„ „	1 00
5C.	Harrison Lake and Lillooet River Valley	„ „	1 00
6A.	Nicola Valley	„ „	1 00
6B.	Princeton and vicinity	„ „	1 00
6C.	Ashnola and South Similkameen River Valleys	„ „	1 00
7.	North Okanagan and Mabel Lake	„ „	1 00
7A.	South Okanagan Lake and Kettle River Valley	„ „	1 00
7B.	Similkameen District (Keremeos, Fairview, and Greenwood)	„ „	1 00
11.	Clearwater and Murtle River Valleys	„ „	1 00
11A.	North Thompson River Valley	„ „	1 00
12.	Dean and Burke Channels and Bella Coola Valley	„ „	1 00
12A.	Dean (Salmon) River Valley	„ „	1 00
13.	Rivers Inlet and Fitzhugh Sound	„ „	1 00
14.	Banks and Pitt Islands and vicininty	„ „	1 00
14B.	Gardner Canal and vicinity	½ inch to 1 mile	1 00
15.	Moresby Island, Northern Portion	1 inch to 1 mile	1 00
15A.	Moresby Island, Southern Portion	½ inch to 1 mile	1 00
16.	Graham Island, North-east Portion	1 inch to 1 mile	1 00
16A.	Graham Island, South-east Portion	„ „	1 00
16B.	Graham Island, West Portion	„ „	1 00
17.	Portland Canal and Observatory Inlet	„ „	1 00
17A.	Skeena River Valley (vicinity of Hazelton)	„ „	1 00
17B.	Nass and Kitwancool River Valleys	„ „	1 00
18A.	Tete Jaune Cache and Upper Fraser River Valley	„ „	1 00
19.	Lower Skeena and Zymoetz River Valleys	„ „	1 00
19A.	Skeena and Kitsumgallum River Valleys	„ „	1 00
19B.	Prince Rupert, Mouth of Skeena and Nass Rivers	„ „	1 00
20.	Bulkley River Valley (Hazelton to Moricetown)	„ „	50
21.	Barkerville, Willow, and Bowron River headwaters	„ „	1 00
21A.	Fraser Lake and Endako River	„ „	50
21C.	Douglas Channel and Kildala Arm	„ „	1 00
22.	Bowron River and Upper Fraser River Valley (vicinity of Hutton)	„ „	1 00
22A.	Fort George and vicinity	„ „	1 00
22B.	Portion of Nechako River Valley and Cluculz Lake	„ „	1 00

* The figures of total revenue for 1919 include total receipts for maps, blue-prints, and other information, while those for 1920 cover blue-prints only.

TABLE C.—DEPARTMENTAL REFERENCE MAPS—*Continued.*

Price-list of Blue-prints—Continued.

		Scale.	Price.
22C.	Blackwater and Mud River Valleys	1 inch to 1 mile	$1 00
22D.	Fraser River Valley, vicinity of Quesnel	,, ,,	1 00
22E.	Goat River and Upper Fraser River Valleys	,, ,,	1 00
23.	Quesnel Lake (East Arm)	½ inch to 1 mile	1 00
23A.	Quesnel Forks and Swamp River	1 inch to 1 mile	1 00
24.	150-Mile House and Harpers Camp	,, ,,	1 00
24A.	Anderson and Seton Lakes, Lillooet District	,, ,,	1 00
24B.	Lillooet District (Clinton, Big Bar, and Bridge River Valley)	,, ,,	1 50
25.	Mainland Coast, Princess Royal Island to Campbell Island	,, ,,	1 00
26.	Porcher and Adjacent Islands	,, ,,	1 00
27.	Fraser River Valley (Williams Lake, Soda Creek, and Alexandria)	,, ,,	1 00
27A.	Fraser and Lower Chilcotin River Valleys and Lac la Hache	,, ,,	1 00
27C.	Green Lake and Canoe Creek Valley	,, ,,	1 00
28.	North Part of Babine and Takla Lakes	½ inch to 1 mile	1 00
28A.	Stuart and Babine Lakes	1 inch to 1 mile	1 00
29.	Chilcotin, West 124 Meridian	,, ,,	1 00
29A.	Anaham and Abuntlet Lakes	,, ,,	1 00
29B.	Nasko and Chilcotin River Valleys	,, ,,	1 00
30.	Bonaparte River Valley and Canim Lake	,, ,,	1 00
31.	Bulkley Valley	,, ,,	1 00
31A.	Francois and Babine Lakes	,, ,,	1 00
32A.	Tatlayoko Lake	,, ,,	1 00
32B.	Homathko and Klinaklini River Valleys	,, ,,	1 00
34.	Lot 4593, Kootenay District, West Portion, Flathead River	2 inches to 1 mile	50
34A.	Lot 4593, Kootenay District, East Portion, Flathead River	,, ,,	50
35.	Saltspring, Gabriola, and Adjacent Islands	1 inch to 1 mile	1 00
36.	Upper Fraser River (vicinity of Hansard and McGregor River Valley)	,, ,,	1 00
38A.	Groundhog Coal Area, East of Meridian	,, ,,	1 00
38B.	Groundhog Coal Area, West of Meridian	,, ,,	1 00
38C.	Upper Nass River Valley	,, ,,	1 00
40.	Euchiniko and Tetachuck Lakes	,, ,,	1 00
41.	Upper Nechako River and East End of Ootsa Lake	,, ,,	1 00
42.	Big Bend, Kootenay District	,, ,,	1 00
42A.	Adams Lake and River	,, ,,	1 00
42B.	Canoe River Valley	,, ,,	1 00
42C.	Columbia River Valley (vicinity of Bush River)	,, ,,	1 00
43.	Peace River, South of Dominion Government Reserve	,, ,,	1 00
45.	Foreshore of Vancouver Island (E. & N. Railway Belt)	,, ,,	1 00
46.	Saanich District and Islands	,, ,,	1 00
47.	Peace River Valley, West of Dominion Government Reserve	,, ,,	1 00
48.	Crooked and Parsnip River Valleys	,, ,,	1 00
49.	Pine River Valley, Peace River District	,, ,,	1 00
50.	Parsnip and Peace River Valleys	,, ,,	1 00
51.	Finlay River Valley	,, ,,	1 00
52.	Atlin Lake and vicinity	½ inch to 1 mile	1 00
53.	Telegraph Creek and Stikine River Valley	,, ,,	1 00
54.	Upper Nass River Valley and Meziadin Lake	1 inch to 1 mile	1 00
18–9S.	Rossland and South End of Lower Arrow Lake	,, ,,	1 00
17–9S.	Nelson, Salmon River Valley, and South End of Kootenay Lake	,, ,,	1 00
4–6.	Moyie River Valley	,, ,,	1 00
115–49.	Elko vicinity	,, ,,	1 00
15–9N.	Fernie and Crowsnest vicinity	,, ,,	1 00
16–9N.	Cranbrook and Kootenay River Valley	,, ,,	1 00
17–9N.	Kaslo and Kootenay Lake	,, ,,	1 00
17–15.	Edgewood, Lower Arrow Lake, and Slocan River Valley	,, ,,	1 00
15–0.	Upper Elk and White River Valleys	,, ,,	1 00
21–23.	Kootenay River, Columbia and Windermere Lakes	,, ,,	1 00
18–20.	Nakusp and Upper Arrow Lake	,, ,,	1 00
27–29.	Columbia River Valley, Wilmer and Spillimacheen	,, ,,	1 00
30–32.	Trout and Upper Arrow Lakes	,, ,,	1 00
17–0S.	North End of Kootenay Lake and Duncan Lake	,, ,,	1 00

NOTE.—These reference maps show lands alienated and applied for, "Timber Limits," "Coal Licences," etc., surveyed and unsurveyed. They are compiled from all available data and are constantly being amended, and their accuracy is therefore not guaranteed. They were prepared originally for departmental use, and, having proved of value to the public, blue-prints of same are now on sale.

Victoria, January 1st, 1921.

REPORT OF THE GEOGRAPHIC DIVISION.

January 11th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the report of the Geographic Division for the year ending December 31st, 1920.

During the period of this report important additions were made in the scope and volume of the work of this Division. The recommendations for a Standard Base Map System and Central Index, referred to in my report of last year, were proceeded with immediately upon entering the new fiscal year in April last.

The requirements for republication of the pre-emptor sheets were not so pressing nor so many as last year, and it was consequently possible to proceed in correspondingly greater degree with the compilation and preparation of required new map-sheets in accordance with the programme we already had outlined.

The industry, co-operation, and interest of the staff have maintained the highest standard of quality and effort in our works and upheld the steady flow of mutual inspiration. The staff as now composed is divided into two sections, the Geographic section and the Standard Base Map section. The former comprises two senior map-writers, one compiler, one junior map-writer, one general draughtsman, and one apprentice, six in all, together with one map-mounter and photostat operator and assistant. Early in the year Major W. G. H. Firth returned from overseas service and resumed his position, whilst W. G. Thorpe was engaged in the beginning of the fiscal year to fill one of the three vacancies which had occurred through former members of the staff taking up other positions upon their return from overseas.

The Standard Base Map staff comprises one map librarian, one computer, three compilers, one checker, one apprentice, with one special assistant compiling geographic gazetteer.

Pre-emptors' Maps.

Name.	No. of Copies.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
Tête Jaune. Compiled to projection	3,000	Feb., 1920	3H	3 m. to 1 in.	6,000
Nechako. Corrected and revised	5,000	April, "	3B	" "	9,000
Lillooet. Compiled to projection	4,500	May, "	3K	" "	11,000
In Course of Preparation, 1921.					
Chilcotin. Compiled and drawn to projection. In hands of printer	4,000	Feb., 1921	3F	3 m. to 1 in.	9,000
Prince Rupert. Corrected and enlarged. Ready for printer	5,500	March, "	3M	" "	10,000

There are now six of our pre-emptors' series completed upon the polyconic projection.

The development of the Standard Base Map System enables a beginning to be made in laying down the control for the recompilation of the area covered by the Fort George, Nechako, and Stuart Lake Pre-emptors' Sheets. These three maps were roughly compiled in plan in 1912 and have been corrected and reissued as became necessary from time to time. It is now possible to prepare and reissue the sheets of this area in a permanent form upon geographical projection, and this work will proceed as rapidly as may be possible.

Degree Sheet Series.

Name.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
In Course of Preparation, 1921.				
Vernon. Sheet compiled to projection, comprising land surveys, contoured topography, etc	July	4J	2 m. to 1 in.	2,000
Kelowna. Sheet compiled to projection, comprising land surveys, contoured topography, etc	August	4K	" "	3,100

In conjunction with the progress obtained in the preliminary work of the Standard Base Map System, commencement was made upon the suggestion of last year for the extension of our Degree Sheet Series to embrace the Okanagan area covered by the photo-topographical surveys made by R. D. McCaw since 1914.

In these new sheets it is proposed to institute combination mapping which will show the surveyed land-lot lines, together with selected "culture" features, and rivers, etc., in black, whilst the relief shown by contour-lines will be in brown, and blue colour will be used, as is our usual custom, in solid colour for lakes, etc.

It is anticipated that these maps, showing the land lots with the contoured relief superimposed to fit, will be greatly in demand and will receive appreciation.

LAND SERIES MAPS.

Name.	Date of Issue.	No.	Scale.	Area in Sq. Miles.
Southerly Vancouver Island. Recompiled; large portion redrawn with enlarged information; 14,500 copies.....	Sept., 1920	2A	4 m. to 1 in.	16,000
In Course of Preparation.				
Powell Lake. To be compiled to projection, drawn, and published	.....	2D	4 m. to 1 in.	.....

The map of Northerly Vancouver Island extends eastward as far as longitude 124° 45′, whilst Map No. 2B, New Westminster and Yale Districts, extends westward to longitude 123° 30′. The territory lying between the two longitudes is one that is likely to attract increasing interest, and a sheet (Powell Lake) has been planned to cover this portion. To obtain a permanent standard for the map a control-line was worked out, based on Campbell River astronomic determination, and on the two astronomic stations, Sechelt and Squamish, which the (Dominion) Astronomical Branch of Ottawa observed at our request during the summer of 1920. The work on this sheet, however, was postponed in October, and cannot be proceeded with until the latitude and longitude determinations are received from Ottawa. Survey ties were made from the astronomical piers at these two places to our land surveys, and also during the summer the necessary survey ties were obtained in order to provide a continuous control-line between the astronomically fixed points.

DISTRICT AND DIVISION SERIES.

In Course of Preparation.—Map of British Columbia; scale, 30 miles to 1 inch.

This work has been well advanced during the year and the major portion of the key colour (black) has been completed. The plotting has been made upon the scale of 1:1,000,000, which is the international scale adopted by the representative nations at the Congress of 1913. This scale was adopted for the reason that it will give a good ratio of reduction to the scale of our four-sheet map of the Province, 17.75 miles to 1 inch, or 1:1,125,000. The map-work and lettering has been designed and drawn to allow of reduction also to the scale of 30 miles to 1 inch, which is the map required at present, whilst should a new wall-map of the Province be demanded, the same original with the addition of further detail will provide this publication.

In conjunction with this 30-mile map of the Province, a review of records of the departments has been made with the object of obtaining a complete index of all existing topographic (contour) surveys of the Province, and, from this, publishing the contour portions on this scale. By the method of showing this information, such map, besides showing the relief, will also be an index to the more detailed data available.

It is hoped that when the base map on the scale of 30 miles is completed it will be possible to make complete up-to-date issues of the various administrative boundaries and divisions of the Province.

GEOGRAPHIC SERIES.

No new work in this series has been undertaken. Should there be an opportunity in the coming year, it is suggested that a general geographic map should be proceeded with covering south-western portion of the Province, and extending northward to cover as much as possible of the Mainland coast-line.

Miscellaneous.

Name.	Scale.	For whom prepared, printed, etc.
Peace River Oil. Reconnaissance by John A. Dresser.	1 m. to 1 in. 5 m. to 1 in.	Water Rights Branch. Drawn for photo reproduction.
Map of B.C. Change in Rule of the Road.....	100 m. to 1 in.	Public Works Department. Prepared and published.
Prince George. Settlement Area No. 5.....	1 m. to 1 in.	Land Settlement Board. Compiled and drawn for photo reproduction.

Several small maps, illustrations, drawings, etc., were prepared in additon to the above.

In past years the publication of our map-sheets has been done with the object of covering the maximum amount of territory on one sheet, this being the mode of economy and speed in production, and also advantageous from the fact that our pre-emptors' sheets were on no geographical projection, but straight plan. With the advent of the Standard Base Map System, which gives a standard uniform control of survey-lines throughout the Province, and also the placing of our pre-emptors' series upon geographic projection, it will be possible to consider the advantage and economy in publishing a smaller sheet, and that governed by and upon a regular degree system of issue. The advantages referred to are that the smaller sheet would be more easily brought up to date and republished, the present wastage in map area would be conserved, the smaller sheet would be more easily handled, and easier and better printing conditions would be obtainable.

Geographical Naming and Gazeteer.

Regular progress has been obtained in conjunction with the British Columbia representative of the Geographic Board of Canada in the naming of the various geographical features of the Province which have come forward for decision. This work, whilst it receives at present very little outstanding appreciation, will be the source of much satisfaction in years to come in the lucidity of our records and the ease with which the geographical features of this Province can be distinguished and located.

It was suggested in our last report that at present no complete up-to-date Geographical Gazetteer was obtainable for administration and public use, and that it would be a work of merit for us to undertake the compilation and publication of such a work. This suggestion was endorsed and a commencement was made early in the New Year. The system of compilation was designed to combine with the Standard Base Map and Central Index, being based upon the geographic quadrilateral system. Besides furnishing the location of each known geographical feature with its present-day name and supplying general data of every-day usefulness, attempt will be made to furnish the two, three, or more names by which numerous features of the Province have been known in past years.

Only one assistant has been engaged upon this work during the whole year, with slight additional help in copying of the cards in the latter part of the year.

During the period of this report 12,721 geographical features have been listed on the special compiling-cards, and it is estimated that there will be a total in the neighbourhood of 20,000 geographical features embraced in this work.

Map-mounting.

The requirements in map-mounting have exceeded those of former years in volume and have been augmented in special degree with fitting and mounting turned out by our photostat machine. In connection with this latter, experimenting and with much skill, numerous new and extremely accurate and useful results have been obtained.

In addition to the following summary of work completed, there was a large quantity of small miscellaneous work which cannot be conveniently detailed.

The room occupied by the map-mounting was found inadequate in wall-space, so that speed in production was impossible. A rearrangement of accommodation was obtained, and the present map-mounting room was fitted up to allow of wall-space—i.e., map-mounting space—for all possible requirement. The new arrangement has worked admirably and speed in operation and production has been effected.

As the result from the system of charging which was inaugurated at the beginning of the fiscal year, it is gratifying to report that the cash receipts and credits for map-mounting have shown margin in excess of the cost of materials and operation.

Loose-leaf map-books prepared	10
Maps cut to fold and mounted	710
Blue-prints mounted	230
Official maps repaired and remounted	25
Photostat prints mounted	298
Miscellaneous, binding field-notes, repairing files, etc.	

In addition to carrying out the map-mounting requirements of the Surveys Branch, the cash receipts and departmental credits for period April 1st to December 31st amounted to $1,400.

PHOTOSTAT.

In the reorganization which took place early in the year the photostat section was placed under the charge of this Division, and when the rearrangement of accommodation took place more efficient space was obtained for the photostat machine, and it was possible to construct a direct copying-board which allows of reductions to a ratio 8:1, whilst the machine originally was constructed to allow only of reduction 2:1. With experiment and careful workmanship a much higher standard of precision and quality of result has been evolved. The actual receipts and credits for this work have almost paid for the cost of operation during the year, whilst if the saving effected in draughting, etc., and time saved through the possession of this photostat equipment is considered, the amount above cost of operation would be large indeed. So far as is known, this is the only photostat equipment operating in the Province, and as the advantage and the availability of this service become known to the public it will undoubtedly be increasingly in demand.

Official plans copied	288
Field-books copied	394
Crown grants copied	78
Tracings copied	65
Blue-prints copied	146
White-prints copied	12
Photostat negatives prepared	80
Miscellaneous	379

Under miscellaneous are listed such work ("copy") as: Photographs, typewriting and other letters, newspaper extracts, extracts from books, reports, plans of boats and machinery, sketch-plans of surveys, diagrams, certificates of birth, marriage, and death, naturalization, discharge, etc.

Photostating, departmental and public, for the year totalled $2,045.95.

MAP STOCK AND DISTRIBUTION.

In the early part of the year change was made in the map-distribution. Owing to the advanced cost of paper and printing the prices of our maps were revised and arrangement was made whereby all applications for printed maps were referred to the Chief Geographer. This has entailed considerable additional work, but since commencement has minimized correspondence and each application has been dealt with within twenty-four hours of receipt.

In addition to maintaining the stock of our own publications, we have maintained small stocks of some 250 different Dominion Government map publications covering British Columbia territory. This stock has proved a great saving in time and correspondence by the public and various departments, as otherwise these would have required to transmit each application to Ottawa. Approximately 300 separate requests were attended to in connection with these Dominion Government publications.

The total number of maps issued to departments and public during 1920 was 20,051. Maps received into geographic stock totalled 27,358. A large portion of the issued maps was embraced by single map requests.

With the beginning of the new fiscal year, by establishing a simple system of accounting and crediting, receipts were obtained for the Branch which would defray a very good proportion of the cost of production; this being satisfactory in view of the fact that every encouragement was given in free map-sheets to those applying for land.

Previous to this year much difficulty had been experienced and much correspondence occasioned through lack of a comprehensive list of bulletins, pamphlets, and general printed data furnished by the Department upon application. Such "publications" list covering all the literature of the branches of the Department was prepared by this Division and, for convenience, was printed upon the back of our list of maps. This has proved of great advantage in reducing correspondence and in enabling us to give, efficiently, available information to the public.

Letters received and answered during the year, 965.

Cash receipts for printed maps for nine months, April 1st, to December 31st	$2,718 31
Credits (Lands Department) for printed maps for nine months, April 1st to December 31st	726 20
Total	$3,444 51

Standard Base Map.

Reference was made in the report of last year to the proposal for the establishment of a comprehensive system for the co-ordination of the land surveys and including the formation of a central cross-indexed record of data pertaining to all surveys of the Province. In the subsequent arrangements the writer was requested to bring these proposals into effect, organize and direct the work of the staff, which was engaged shortly after the beginning of the fiscal year.

The first work undertaken was the preparation of the skeleton traverses comprising the control routes between geodetic or astronomic established points, based on the strongest chain or chains of lot surveys available; these to be compiled, computed, and balanced to establish two or more positions of latitude and longitude in every 30-min. quadrangle wherever such traverses were available. It was arranged that whenever this initial work had progressed sufficiently additional staff would be furnished to carry on the second operation, which was to plot referred-to control traverses between the computed positions, and from these plottings obtain two or more control stations for every ten-minute quadrangle. The third operation would then commence, that of plotting each 10-min. quadrangle of the Province, in accordance with the details which have since been worked out on the scale of 20 chains to 1 inch, upon the polyconic projection. These 20-chain scale sheets, when completed, would be the Standard Base Map sheets, comprising all the available data of each area in correct relationship to its geographical position on the surface of the earth, and give the utmost accuracy as far as existing surveys allow, i.e., ensure equal accuracy to all maps instead of the great variation that at present exists between the different plottings, will facilitate work in the field, and minimize work in the office, etc. It will, if carried properly to fruition, provide economy and dispense with the triplication in draughting which has resulted through lack of such systematizing.

With the staff now operating, the first operation has advanced even more successfully than was anticipated. Within the time estimated sufficient work had been done for the commencement of the second operation. Whenever the recommended additional staff should be available, progress can be made with the second and third operations. It is, however, proposed that, with the present small staff operating, the laying-down of the skeleton traverses, the compiling, computing, and balancing, the fixing of the main control positions, shall be proceeded with as the first essential, until as much as possible of this work throughout the entire Province is completed.

The progress to date is as follows: 9,342.10 miles of traverses have been laid down, which is a creditable showing, considering the difficulties encountered in the old surveys and the searching of records for information to ensure accuracy in the system. The area south of the Railway Belt is almost completed. Main control-lines have been laid down in the central sections between Squamish and Fort George, with offset-lines to Ashcroft and Fraser Lake; and this section is well advanced as far as connected lines of survey are now established, although to complete its control strength will not be possible until necessary survey connections are obtained. In the northern section a connected control-belt has been established from Prince Rupert to Yellowhead Pass.

The computing and balancing is comparatively slow work in order to obtain the very best and permanent result, but so far as it has proceeded has provided proof that our scheme is

practicable, and the resulting differences from the surveys to be balanced have been even much smaller than anticipated; this, of course, being a demonstration of the effect of the law of compensation in error throughout the various surveys.

In the geographical map compilations undertaken in the Okanagan, Powell Lake, and Chilcotin areas, construction along standard method was employed, so that such would be available in form to be incorporated into the scheme of the Standard Base Map.

CENTRAL INDEX.

Work on the central cross-index for all available survey records of the Province was begun in the middle of the year, but already about 15 per cent. of the plans on file in the surveys vault have been examined and recorded. Moreover, since instituting the method, the following departments—Mines, Works, Water, and Forest Branches—seeing the advantages of this indexing over the old alphabetical and numerical system, have decided not only to co-operate in the central-index system, but to adopt and install our quadrangle geographical system to supersede the systems they have been using. It is gratifying to have received this endorsement, and, moreover, it will reduce both the time and difficulty of establishing the central system through having each department and branch interested complete its own central record in uniformity.

I have, etc.,

G. G. AITKEN,

Chief Geographer.

55TH PARALLEL OF LATITUDE.

BY R. P. BISHOP.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to report on my season's work for 1920 on the 55th parallel of latitude.

This line, which forms the boundary between Cassiar and the Coast Districts, had in 1914 been run west for 17 miles from the 124th meridian, which in this Province serves the purpose of an initial meridian.

This year I produced the parallel west to Middle River, beyond which a range of snow-capped mountains prevented further progress at the time of year. I also carried a subsidiary triangulation to the south as far as Fort St. James in order to tie in surveys lying along the shore of Stuart Lake.

The 55th parallel west of Babine Lake was run out in 1913 by A. Holland, who ran east to within 4 miles of Babine Lake from a point on the line of the Grand Trunk Pacific at Moricetown, the position of which had been astronomically determined under the direction of the Dominion Astronomer, Ottawa. I will refer later to the question of connecting these two portions of the line by triangulation over the mountains.

GENERAL REPORT ON THE DISTRICT.

A good deal of attention has been recently directed to the Stuart Lake country on account of the possibility of an extension of the Pacific Great Eastern towards the Peace River passing in this direction. As these reports are largely for the guidance of intending settlers, and as the survey-line cut this year lies for the greater part along the high land of the Pacific-Arctic Divide, I will first of all give a description of the country around Stuart and Trembleur Lakes, where the bulk of the agricultural land is situated. This account will necessarily be brief and incomplete, as this portion of the district was visited en route only.

It is well to point out at the start that at the present moment there is practically no Government land now open for settlement, and that the country has not yet been opened up as far as transportation conditions are concerned.

The entire question of transportation will probably remain in abeyance until full reports are available on the merits of the various routes possible for the Pacific Great Eastern extension, which may or may not come near Stuart Lake. The subject is not within the scope of this report.

It will thus be seen that the Stuart Lake District is undergoing a transition stage and that any remarks on present means of travel will probably be out of date in a very short time.

Fort St. James.

The social, political, and business life of the district centres in Fort St. James, at the south-eastern end of Stuart Lake. This post is, with the exception of Fort McLeod, the oldest in the Province. It was established in 1806 for the North-west Company by Simon Fraser on what he thought were the headwaters of the Columbia River. As everything at first came overland from Eastern Canada, Fort St. James was for a long while the distributing centre for the other posts. For a time it was supplied from Fort Vancouver via Kamloops. Later on, until the construction of the Grand Trunk Pacific Railway, the fort still kept its position as distributing centre to a certain extent, supplies being sent in by the Skeena River to Hazelton, pack-train to Babine, and thence by scow down Babine and Stuart Lakes, the intervening portage being traversed by a wagon-road. Transport along these old fur routes was reduced to an almost perfect system, so that to this day the expression "Hudson's Bay" is used in the Far North as a synonym for speed.

At present there are three stores, a large Indian village with Roman Catholic Mission, and several white residents mainly interested in the purchase of fur. There are a few farmers in the district who are roughing it out under pioneer conditions, but nevertheless seem to like the country.

Accommodation.

The Hudson's Bay Company has a limited amount of accommodation and will do its best to put one up, but it is best to arrange about this beforehand by telephone.

Boats and Canoes.

There are several motor-boats at Fort St. James, but as gasolene is extremely expensive most of them are not in use. D. Hoy was this year running a boat which in the spring towed the survey outfit as far as Trembleur Lake. As a rule, however, most boats do not go beyond the first rapids above Tachi, for which canoes are generally used.

Indians.

There are plenty of Indian canoes on the lake, but if an unfavourable wind springs up the traveller is liable to get held up, especially when in a hurry. There is a small Indian village at Pinchi, a larger one at Tachi, two families at Grand Rapids, and two at Trembleur Lake village at the mouth of Middle River. There is also a village at Nancut, whence the old wagon-road runs to Babine Lake. A motor-boat runs up here once a fortnight in summer with the hatchery mail, calling at Tachi on the way. The road is said to be in good condition, the local Indians claiming that they keep it in repair, but I have no knowledge on this point. I have not visited Nancut village, but am informed that there is no difficulty in hiring wagons there for hauling freight across the portage to Babine Lake.

Stores.

The Tachi Trading Company, managed by A. G. Hamilton, has a store on a small island opposite the Tachi Indian village, at the mouth of the river of that name. The store has a large stock of luxuries as well as the necessaries of life, and carries on a considerable trade with the Indians. In October Mr. Hamilton usually makes a trip to the Indian village at the head of the North-west Arm of Takla Lake, where he buys dried salmon which has been packed over the horse-trail from Babine, where these fish are more plentiful than in the depleted lakes of the Fraser River watershed.

Main Physical Features.

In order to explain the possibilities of the district, it is best first of all to outline the lake-basins and other physical features which control the lay of the agricultural land, and which should, if taken intelligent advantage of, greatly affect the question of cheap transportation and, consequently, the development of settlement.

The Pacific-Arctic Divide, which is a little to the north of the 55th parallel, runs approximately in an east-and-west direction until within a few miles of Middle River, where it swings off to the north-west, roughly paralleling North Takla Lake. South and west of the divide lies

the basin drained by the lakes and rivers of the Stuart River system, which provides remarkable stretch of almost unbroken navigation for a distance of 125 miles north-westerly from Fort St. James. Paralleling the Stuart River system, and about 25 miles to the west, lies the 90-mile length of Babine, the largest lake in the Province.

Low passes at the west end of both Stuart and Trembleur Lakes connect these two main valleys. These passes contain excellent tracts of agricultural land and both have been traversed by wagon-roads in the early days, when such things were somewhat of a curiosity in the north. The Trembleur Lake Road was part of the route to the Manson Creek diggings in the days when the gold excitement was at its height. At the east end of the road lies the hull of a steamer—the old "Enterprise"—which during the rush plied along Trembleur Lake and up the Middle River to connect with the trail at Takla Lake. The remains of the steamer have for many years provided the local Indians with a supply of iron, which they have not been slow to take advantage of. This steamer was built at Soda Creek, whence she came by way of the Fraser, Nechako, and Stuart rivers under her own steam to her destination.

The other portage, connecting the south end of Babine Lake with Stuart Lake, until recently formed part of the Hudson's Bay Company's supply route already referred to.

North of the Trembleur Lake Pass, and between the two main lake systems, are some snow-capped mountains known as the Middle River Range. Generally speaking, the country to the north of the parallel, along the shores of North Takla Lake, is mountainous. To the south it is more or less flat, with rocky hills rising about 2,000 feet above the general level.

SOIL-DISTRIBUTION.

The Stuart Lake basin is aptly described by J. H. Gray as "an old glacial lake, probably 200 miles long, with numerous arms and variable width, probably 100 to 200 feet deeper than the present lake, and containing numerous islands which are now hills, the silt area being all the space between the present lake and the old basin-rim." This description is well borne out by observations made this year. Wherever soil occurs on the higher levels it is usually glacial drift and unsuitable for cultivation.

As the greatest portion of the arable land has been surveyed into sections, a good general idea of the shape can be obtained from Pre-emptors' Map No. 3c. There are, however, two localities where blocks of unsurveyed land are reported—viz., to the north-west of Tezzeron Lake and south of Stuart Lake, along the headwaters of Sowchea Creek.

In addition to the surrounding unsurveyed land, a tract of about 60,000 acres around the south-east end of Stuart Lake was during the war placed under reserve by the Provincial Government under the "Soldiers' Land Act."

An extremely interesting account of this land and of the general possibilities of the district, written by J. H. Gray, appears in the Annual Report of the Minister of Lands for 1918. Mr. Gray quotes reports by a specialist from the United States to the effect that the soil ranks among the best in North America. The expert attributes its properties to the great percentage of wind-blown volcanic dust mingled with the original lake deposit. The soil is certainly of excellent texture, and carries more vegetable matter than the Nechako silts and a certain amount of clay, but nowhere in the locality did I see any of the hard clay which crops up in places around the eastern end of the Nechako Valley, and which is so hard to work up into good condition.

In this connection it is interesting to note that the jack-pine land in the Nechako Valley, which was generally condemned in the early days, has been found to give good results wherever the soil approaches the nature of sandy loam, but is disappointing where the soil is clayey.

The Mines Department Report for 1905 gives the analysis of several soils taken from different districts of the Northern Interior. The sample from Stuart Lake appears to be somewhat deficient in lime. There will be no trouble, however, in obtaining a good supply of this locally, as there is an abundance of limestone around the shores of the lake, from which lime has been burnt for many years.

CLIMATE.

I cannot say very much about this from personal observation, except that there were no summer frosts this year. As regards rain, the words "exceptional year" are so hackneyed that I hesitate to use them, but am at a loss how otherwise to describe the latter part of this summer, which was very different from any I have experienced before in the north. Numbers of farmers in the Nechako lost their crops, but other parts of the Province had similar bad luck this year.

The bad weather started in the middle of the hay harvest, so that those who stacked theirs early were fortunate. Silos, which are coming very much into fashion around Vanderhoof, will probably do a lot to ensure farmers against heavy loss of feed in the rare event of another fall like that of 1920. Judging from the vast area of burnt-over forest, the summers here should not as a rule be very wet.

The winter of 1919–20 was exceptionally long and feed very scarce towards the spring. One settler who had brought in a large quantity of stock without taking the precaution of securing his winter feed lost heavily. New-comers should get in before hay harvest and make certain of the winter's feed. Quotations for wintering in the autumn of 1920 varied from $20 to $30 per horse.

This may seem to be a gloomy account of the climate for the year, but one must describe variations of climate as they occur. The thing that impressed me most was that in the spring I was able to pick up cayuses around Fort St. James and Tachi more cheaply and in much better shape than in the Nachako Valley.

In the Mines Department Report for 1905 W. Fleet Robertson includes, in a comprehensive account of his trip through the district, a series of meteorological observations of temperature, rainfall, etc., covering the period from 1895 to 1903, as well as a phrenological report for 1905. The observer was A. C. Murray, who is still in charge of the meteorological station at Fort St. James.

Agricultural.

The Hudson's Bay Company are the only people around Stuart Lake who have gone in for farming on a considerable scale for any length of time. Their results have already been reported on. Several other settlers have farms under way, but as I did not stop very long in the settled parts I was unable to visit them. Potatoes do very well in the silt soil around the lake, and I heard some astonishing accounts of their size and weight. Excellent vegetables were procurable from the Indians at Tachi Grand Rapids and Trembleur Lake villages.

Dairying.

The co-operative creamery established this year by the Provincial Government at Vanderhoof will have a far-reaching effect in encouraging and demonstrating the dairying possibilities of the country. So far the creamery seems to be a success. This is extremely important, as it seems that agriculture here will depend largely, if not entirely, on the success of the dairy business. The district will probably find it difficult to compete with the Prairie in growing grain on account of the expense involved in clearing land; furthermore, it cannot be called a good range country, as the natural vegetation, although luxuriant on the good soil, does not reproduce freely enough after heavy grazing. There will probably always be some scattered grazing on the poorer land and possibly eventually in the summer on the higher hills.

As the dairy business develops throughout the north and milk routes have to be evolved, the question of good transport will become more pressing than ever and will tax the resources of the country to the utmost.

Scenery.

So many capable pens have dealt with the beauty of British Columbia that one hesitates to approach the subject. Much has been written of the more mountainous parts of the Province, but little has been said of the Northern Interior Plateau, which to my mind possesses, even in its more featureless parts, a peculiar beauty of its own; especially in the fall of the year, when its great stretches of yellow poplar and the deeper orange of the cottonwood form a vivid contrast with the dark green of the spruce and pine.

Where this plateau merges with the rugged country to the north, it combines with lake, island, and mountain to form yet another type of scenery. Although the mountains which border Middle River and Takla Lake cannot well be compared with the higher ranges of the Province, I gathered from the alpinist of the party that some of the rougher parts would afford quite reasonable neck-breaking facilities to any mountaineer who didn't feel like doing things in style on the higher peaks. Be this as it may, the ranges form a remarkable background for the rest of the scene, especially the white mass of Mount Blanchet, which viewed from Middle River appears to be floating on Takla Lake, the arms of which nearly surround it.

The few hills near Stuart and Trembleur Lakes are comparatively low, rising about 2,000 feet above the water. The view from these, however, gains greatly in character from the number

and size of the lakes in the country, no fewer than forty of these being reported visible from Mount Pope, a few miles from Fort St. James.

A succession of wonderful panoramas are seen during the trip up the great waterway, which, studded with islands to the south and everywhere abounding with fish, will undoubtedly, with better access, prove a great pleasure resort.

GAME.

Moose are now common throughout the district, although in some parts they are much more plentiful than in others. The Indians depend on them almost entirely for their supply of meat and hide. Moccasins and gloves are now all made of moose-hide, whereas deer generally furnished the raw material some years ago, before the moose moved into the district in such numbers. The Indians are inclined to kill them off somewhat recklessly, apparently being under the impression that the supply of these animals is inexhaustible. It is to be hoped that they will not share the fate of the caribou on the Middle River Range, which are, I believe, now extinct. There are said to be some caribou on the hills to the east of the 124th meridian. Deer are found in varying quantities throughout the district.

Black bear are found everywhere and a few grizzly in the mountains. The Indians seem to hold the latter in great respect and don't like invading their territory. This was particularly noticeable one evening at tea, when a noise was heard in the distance which alarmists declared to be a hungry grizzly on the warpath. Others said it was only a loon, but optimists and pessimists alike became suddenly interested in the surrounding timber, which, being only second growth, naturally came in for some disparaging remarks.

Two parties of American big-game hunters came in after grizzly this year and got as far as Takla Lake, but unfortunately struck the worst part of the wet weather and didn't bag any. Perhaps in one case the plan of action adopted had something to do with the bad luck, as the Nimrod's idea of having his grizzly driven down to the shore of the lake to be shot at did not meet with enthusiasm on the part of the "beater"—that worthy being unprovided with a tank.

Fur-bearing animals of all kinds abound and the unusually high price of fur, culminating in the autumn of 1919, caused an active competition among the local stores for the trade of the Indians, who were not slow to take advantage of "jawbone" when offered. The fall in prices this year hit everybody pretty hard in consequence.

There are plenty of grouse and fool-hen everywhere and ptarmigan on the Middle River Range; also any quantity of ducks and geese on Middle River in the fall before the freeze-up.

Rabbits vary greatly in numbers according to the season, as in other parts of the north. The "big year," which is said to occur once in seven, is expected in about two years' time.

FISH.

Trout and whitefish are very plentiful, especially in the more remote lakes, and form the staple diet of the Indians, who split and dry a large stock for winter use. The netting and drying are attended to by the women, who excel at this business.

Some sort of an industry will probably develop here when there is good enough communication with the outside world to place the fresh fish on the market.

The whitefish will not take a spoon and so have to be netted. Trout, on the other hand, will take a fly, spoon, or piece of tobacco-can impartially when in the mood. The only trouble then is to get a line strong enough to hold the fish, which run to a considerable size. At Inzana Lake, when we had run out of bacon and were depending largely on fish to eat, the trout asserted their independence by breaking all the lines and making off with the spoons. (All, of course, were of prodigious size!) The pack-train turned up at last with the cheering news that there was no bacon in the country, as the Grand Trunk Pacific longshoremen at Prince Rupert had gone on strike. Luckily a net arrived in camp, so that we were able to get plenty of whitefish in lieu.

One of the lake-trout caught here measured just under 36 inches in length. The rainbow are usualy smaller, but put up a much better—or worse—fight, depending on your point of view as sportsman or pot-hunter. There are said to be plenty of sturgeon in Stuart Lake and a few have been caught there by the Indians. A white man at Vanderhoof this year brought in some large sturgeon-nets with the idea of going into the business seriously on the Nechako River.

Salmon are practically a thing of the past. A supply of dried salmon is brought over from Babine, which lake drains into the Skeena and has in consequence a better supply of these fish.

TIMBER.

There is plenty of fir on Stuart and Trembleur Lakes and a good stand on Tezzeron, north of which it ceases suddenly. I saw only one specimen on the north shore of Inzana Lake and none to the south as far as Hatdudatehl Lake.

There is a fair growth of spruce on the north shore of Inzana Lake, which extends for a mile or so inland; beyond this most of the country has been burnt over and is covered with fallen logs and second growth extending to the hills in the neighbourhood of the line. Here there is a growth of spruce and balsam, which, though heavy and thick in the butt, is gnarled and stunted and of no use for merchantable lumber. There is a very good stand of spruce extending for some miles along the parallel east of Kazchek Lake, and some to the north-east of Rice Lake, locally known as Natazutlo.

To the south of Inzana the country has been burnt over as far as Tachi, the windfalls being very difficult to get over or cut a trail through. The burnt-over country here seems to have been mainly pine, and the dead logs run to a considerable size for that kind of tree. There is still a good stand of pine just to the west of Tchentsut Mountain, along the trail connecting Inzana with the north-east corner of Trembleur Lake. Spruce, balsam, and pine spring up after a burn, the last-mentioned species usually being on the highest and driest tract. Poplar comes after the burns on the better class of soil, but as one gets farther north or higher up it only appears in any quantity on slopes which have a southern aspect.

THE MANSON CREEK TRAIL.

The Manson Creek country was until recently generally reached by way of Hazelton and Takla Lake. In the days of the mining excitement, when it paid to keep a steamer on Trembleur Lake, advantage was taken of the water route down Babine Lake to the Wright's Bay Portage, thence by steamer to Takla Lake. Later this part was replaced by the trail from Babine to Takla Lake, where the crossing was made by a scow whenever the somewhat uncertain habits of the ferryman fitted in with the programme of the traveller.

This route is now abandoned and the country is approached by trail running north from Fort St. James. The southern portion of this trail, which had been little used for some years, was put in shape by Mr. Milligan for the Nation Lake surveys of 1912 and 1913.

At the beginning of this year the trail was in very poor shape and impossible at high water, as most of the bridges were washed out. Since the spring a good deal of work has been done on it by the Public Works Department, W. Steele, of Manson Creek, being in charge. I understand that another year's work will put it into good shape right through to Manson Creek, a distance of 117 miles. Mr. Steele has, on request, kindly furnished me with a statement of the camps, feed, distances, and other particulars of the trail. As this work is not yet complete, and a portion of the old trail which passes through windfall country may have to be relocated, I am not submitting Mr. Steele's account for publication. I am, however, attaching it to the report, so that anybody going into the country can be supplied with a copy on payment of cost of typing.

It is a very good thing that the work was taken in hand this year, as several parties interested in the mineral resources of Manson and Germansen Creeks made the trip this year. Although I can say nothing of that part of the country from personal experience, it seems evident that the northern territory is attracting a good deal of attention in certain mining circles, and that the completion of the trail will help considerably to foster this. There are proposals on foot to take heavy machinery into this part of the country from the west, making use of the waterways from Fort St. James to Takla Lake. These proposals would, of course, become more feasible if these waterways were connected with the outside world by a system of cheap transport.

WORK ON LINE.

Route adopted.—The party fitted out at Fort St. James, where the Hudson's Bay Company gave every assistance. Arrangements had been made beforehand through the company's headquarters at Victoria for horses to pack the outfit to Inzana Lake by way of the Manson Creek Trail, also for information as to the probable date of feed on the trail, etc. Mr. Fraser, the local manager, went to a good deal of trouble in procuring horses and rigging, which take a certain amount of hunting-up nowadays since the advent of roads has put the large pack-trains out of business.

It was arranged to leave Fort St. James about June 10th, as the season was about a month late. The rain, however, had been so bad, and such gloomy reports came in about the high floods and washed-out bridges on the Manson Creek Trail, that I decided to go by water via Trembleur Lake and cut a trail to the west end of Inzana. I heard later from the trail crew that this was the only possible way to go in at that time.

The new way was somewhat roundabout and it took a long time to cut the trail, but this was useful later on, as it afforded a short route to the middle of the work. Another advantage gained was that we were able to reconnoitre and locate stations for the subsidiary triangulation well ahead of time, and were accordingly able later on to take observations on to these as the work proceeded on line.

The original pack-train arrangements had all to be cancelled in view of the change of route, so fresh horses were procured at Tachi and driven up to Trembleur Lake.

Tachi River—The Tachi River was in full flood, so that the motor-boat had a bit of a struggle to tow the two skiffs in places. These had to be lined up the rapids, a somewhat slow process, as there were a lot of bushes and small trees on the bank around which the line had to to be passed.

The main obstructions to navigation are two sets of rapids a few miles above Tachi and the Grand Rapids, which are at the mouth of Kuzkwa River close to Trembleur Lake. The first rapids could probably be made navigable at all times for shallow-draught steamers if a few rocks were blown out and the stream confined to a narrow channel. At Grand Rapids there is an abrupt drop of 2 or 3 feet at low water, but as the worst rocks have been blown out there is now a straight run with no complications.

Inzana Lake.—From Trembleur Lake the trail cut to Inzana followed an old foot-trail which seemed to take the easiest route through the windfalls and muskegs, both of which are very bad there. The cutting was heavy and the work slow, but the trail will probably be useful later on. About 2 miles west of Inzana Lake the trail crosses Inzana Creek, a stream of considerable size, but not navigable.

Inzana Lake is about 14 miles long, its shores are well wooded on the north, but hideously burnt over to the south as far as the eye can see.

We moved camp down the lake by a raft and two canoes, the latter belonging to Benoit Prince, of Fort St. James. This enterprising half-breed has canoes in most of the lakes round about and has cut a good horse-trail to the east end of the lake.

The end of the parallel had to be located from the Manson Creek Trail and a back-pack trail cut down to Inzana Lake. The line passes at first through a very broken country mostly burned over, covered with fallen logs and second growth, and altogether a tough proposition for back-packing. Half-way down the lake we gave up camping near the line and walked to work from the lake-shore. Generally speaking, there is a good stand of spruce along the shore, which about half a mile inland changes to a mixed second growth of spruce, pine, and balsam, with a good deal of hardhack and willow. I deal with the subject of timber elsewhere. About Mile 25 there are some open spots supporting luxuriant mountain vegetation in summer, but these are rather too inaccessible for grazing purposes. At the west end of Inzana Lake are a few pockets of soil which may eventually be used, but these are too scattered to be worth surveying at present.

An extensive tract of flat country extends south-easterly from Inzana Creek to Tachi. Viewed from Tchentsut Mountain, it seemed capable of holding a good deal of agricultural land. This tract proved very disappointing when our trail passed through it, and most of the "meadows" seen from the hill turned out to be muskegs which proved serious obstacles to the pack-train.

Meadows and Feed.—Incidentally, I may remark that we found very few natural meadows anywhere near the line, far fewer than in the country traversed by the 53rd parallel. Near the northern line when the beaver have abandoned a swamp it soon gets covered with willows instead of turning into a hay meadow. In October, after the feed on the side-hills was frozen down, we drained a few swamps to provide feed for the horses, but couldn't get them to eat the grass. There was excellent "goose-grass," however, on the Middle River flats. As peavine on the side-hills shrivels up and the dry pods are not sufficient to provide feed as is the case farther south, it seems best to avoid pack-train work after the first week in October.

This apparently does not apply to all parts of the country, as W. Steele bought some horses at Fort St. James which he proposed to pack up the Manson Creek Trail to the Omineca country well after November 1st.

Kazchek Lake.—The trail to Kazchek Lake was difficult to cruise and hard to cut out, as the country was strewn with heavy windfalls intersected by numerous muskegs. The line runs through an extensive stand of good spruce before reaching the lake. There is a large flat around the north-eastern side of the lake, but this seems to be under water in the spring.

There are a few small patches of good-looking poplar country north of Kzachek Lake. From the north shore a foot-trail runs to Alexander Lake, known to the Indians as Klochchaw or Big Whitefish Lake. The Trembleur Lake Indians have canoes here as well as on Kazchek Lake.

A low-lying tract of land runs from these lakes towards the west end of the Nation Lakes. This appears to contain a certain amount of timber, is well watered, and may contain some good land, but judging from the rest of the country I should say that this is not very probable.

West of Kazchek Lake is a limestone hill known as Kazchek Mountain. This is separated by a valley from the hill shown by this name on the reconnaissance map which overlooks Klochchaw Lake and known as Klochchawius. The suffix "ius" denotes a wooded hill, while a rocky snow-capped mountain is described by some word which I am unable to pronounce, but which sounds like "Tsutl."

A rough triangulation was made of the west end of Kazchek Lake, as a couple of points were tied in by sights from the line where it crossed the mountain. The creek flowing out of the lake is of considerable size and should furnish a good supply of power some time.

The best meadows struck during the trip were on the trail cut between Kazchek and Eagle Lakes. These would probably produce some good hay if the beaver-dams were cut.

Eagle Lake.—At Eagle Lake, locally known as Natazutlo, we tied on to some sections which had been surveyed on the north shore. These sections, where crossed by the line, did not come up to our expectations either as regards agricultural land or "good running." The surface was broken and the soil mainly glacial drift until the line got into the bottom lands, about 2 miles before reaching Middle River itself.

Middle River.—The soil in this bottom seems to be good sandy loam, rather lighter in quality than that around Stuart Lake. There are some large willow bottoms in the valley of Natazutlo Creek and the remainder of the country had been burnt over about forty-five years before and is now covered with a dense second growth of "Christmas-trees." The north bank of the creek, on the other hand, grew only a few scattered poplar and looked very well. The beaver cuttings have been very extensive and looked like a slashing. We were shown the site of a garden which was reported to have produced good crops of potatoes, carrots, cabbages, etc. It belonged to an Indian called O'Ne-ell, who died a few years ago. His cabin is on the bank of the river a few chains above the parallel.

The western side of the river is here covered with heavy spruce and willow which rises shortly to the foot-hills of the Middle River Range.

The horses had been sent out as soon as we reached Natazutlo Lake, and camp moved later by raft to its western end, whence we back-packed by a foot-trail running in a south-easterly direction to the river through some nice-looking poplar country.

After the line had crossed the river and had been well marked on either bank we packed up with all speed and started down-stream for home on October 30th. High time, too, as there was only half a day's grub left and another storm brewing.

Weather and Conditions.—For the last month the weather had been comparatively open, the snow melting off the trees every few days. The state of the ground made it extremely difficult to run the line straight, as the back-sights warmed up with the sun and tended to lean over towards the south. To prevent this we had to drive a hole in the ground and hammer in a stake with an axe, setting a nail on top for a back-sight. Azimuth observations were very hard to obtain throughout the summer, as the sky was usually cloudy. These observations, although obtained in daylight, usually meant a long walk over windfalls in the dark for the observer, who arrived in camp any time up to midnight.

Subsidiary Triangulation.—My instructions were to make all possible triangulation and other ties to existing land and reconnaissance surveys, with a view to the preparation of a map of

the district on the scale of 1 inch to the mile; also to show main topographical features where time allowed.

The size of the party did not permit the execution of any detailed contour-work along the line as in certain previous surveys of this nature. Furthermore, in this particular piece of country such work would not have been of much practical value, so any time which could be spared from work on line was devoted to making ties rather than lesser topography.

The only surveys close to the line were the Middle River sections and Swannell's triangulation of Inzana Lake. These were tied to in due course.

To give shape to the map to the south it seemed necessary to fix points to govern the position of the somewhat varied collection of surveys extending along the Stuart Valley from the 124th meridian to the 55th parallel on Middle River. This could best be done by making ties to the key surveys—viz., the more extensive blocks and the detailed triangulation.

The more important existing surveys were: (1) Swannell's triangulation of Trembleur Lake, extended by Butterfield to the west end of the lake, and thence connecting by the Wright's Bay surveys to Babine Lake; (2) the Tachi-Pinchi block of surveys on Tachi River and Stuart Lake; (3) the Fort St. James block of surveys extending from Stuart Lake to the meridian.

Ties already existed from (1) and (3) to Swannell's adjoining reconnaissance stations on Tchen-tsut and Pope Mountains, so that by fixing these points from the parallel it was possible to tie in the reconnaissance-work at the same time as the detailed surveys. Connection with the other block (2) was effected by a tie to Tachi Church, situated on the Indian reserve at the mouth of the Tachi River. The church is visible from most points of Stuart Lake and will make a good monument for placing in position future surveys made in this neighbourhood.

The positions of the triangulation stations were fixed by taking shots from line on to beacons erected at Tchentsut and Chuius (Tezzeron Mountain). The rays thus obtained were subject to any uncertainty in the azimuth of the parallel at the various points of observation; so it was arranged, on completion of the work, to set up on these beacons and read the angles between the various points on line. An accident to the writer and, later on, weather conditions prevented the completion of the programme, but it is considered that sufficient data has been obtained to carry out the main object of the work and that the points obtained can be plotted without perceptible error on a scale of 1 inch to the mile.

To the north of the line are the land surveys on Nation Lakes by Milligan and a series of lake triangulations by Swannell, all pivoting on a cairn of the reconnaissance survey located on Nation Mountain. This cairn may now be placed roughly in its position on the map, but can, together with several other stations of the reconnaissance survey, be accurately intersected if the connection of the parallel with the line west of Babine Lake is made by triangulation over the Middle River range of mountains.

Completion of the Parallel.—In view of the high and broken nature of the Middle River Range, it is submitted that accurate chaining over them would be a very difficult matter; furthermore, as the country adjoining the uncompleted portion of the parallel does not appear to be of sufficient value to justify the expense of cutting out and posting the line, the better plan would be to make the tie by triangulation. A good base for this purpose can be obtained by using the line between Kazchek Mountain and Middle River, as there is a good view of the hill-tops from each end of this section. By its use the tedious process of expanding from a short base through a series of triangles can be avoided.

Lake Surveys.—I have referred to the survey of Inzana Lake by Mr. Swannell. As there are a good many lakes still unmapped in this part of the world, I would suggest that, when surveyed, these be dealt with on similar lines, as the method adopted is particularly suited to the country.

The features peculiar to the Inzana Sheet are: (*a*) It shows particulars of all bearing trees and reference marks of triangulation stations; (*b*) it gives rectangular co-ordinates (northings and eastings) of the same.

In default of a complete survey of the country an extension of this system to the lakes remaining unmapped would at a very low cost serve two purposes by furnishing at the same time: (1) A supply of geographical information; (2) a system of monuments on the ground.

(1.) A survey of the lakes would quickly give the information most urgently required for mapping purposes. Furthermore, a basis would be provided for accurate topographical maps which could be completed as wanted, first of all by trail and river traverse or possibly aeroplane

photographs, and, later on, by complete contour detail where required by the Forestry Branch or any other department.

An additional importance is given to the mapping of the waterways by the fact that in a wild country these afford aviators the only means of checking their position, apart from dead reckoning or astronomical observations. The pilots engaged in the flight from New York to Nome this year felt the lack of good maps, particularly farther north.

(2.) As regards the question of monuments, these are required for forestry and other cruises and for tying in land, timber, mineral, and other surveys.

As the great part of the land and timber is on the low land adjoining the lakes, monuments on the shore-line are generally located in the most useful position. Furthermore, they are easily accessible and have the advantage over section-posts buried in the woods, in that they are easily found even after many years, the features of the shore-line acting as way-marks to their position.

The disadvantage, in comparison with section-lines, that the posts are not placed at regular intervals, is overcome on the Inzana Sheet by the tables of northings and eastings, so that cruisers or surveyors starting at one point can check up their reckoning on the next. A photographic reduction of the plan referred to, made in the Department on a scale of 1 mile to the inch, condensed all information into a form suitable for us in the field.

These lake surveys are at low water very cheaply and quickly performed, as paddling a transit about in a canoe is cheaper and more comfortable than walking along a line or staggering up a hill with the machine on one's back only to find that clouds obscure the view.

The lakes in this part of the country can generally be placed in their relative position on the map without any trouble, as a good view can nearly always be obtained from their shores of the many bare-topped hills peculiar to this country, which are so well adapted to the purpose of triangulation control.

I have, etc.,
R. P. Bishop, B.C.L.S.

RANGES 4 AND 5, COAST DISTRICT.

By V. Schjelderup.

Burns Lake, B.C., November 24th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report of the district in which I carried out the survey of Crown lands under your instructions:—

The total acreage surveyed was 14,433 acres. The bulk of this area lies west of Burns Lake, in the vicinity of Decker Lake, Rose Lake, and Topley, on the Grand Trunk Pacific Railway. Some 2,700 acres were surveyed near the west end of Cheslatta Lake and a number of scattered surveys made east of Burns Lake, near Tintagel, Priestley, Savory, and Fraser Lake. One small parcel was also surveyed in the Greer Valley, some 25 miles south of Fort Fraser. While at Cheslatta Lake a trip was made to the east end of Murray Lake, where a tie traverse was run for some 5 miles to connect the surveys on the Upper Nechako River with Murray Lake, the latter having been triangulated and connected with Cheslatta Lake and surveys in Francois-Ootsa Lake District.

Vicinity of Palling and Decker Lake.

The surveys made in this locality are skirting the old surveys on the east and take in all the land left in this vicinity suitable for settlement. The land comprised in the survery made by me is not as a whole of the same standard as that of previous surveys made in this section of the district, but compares favourably with other land surveyed in the district which has been taken up under pre-emption record or purchased. A number of settlers are awaiting the gazetting of these surveys with intention of filing on same as soon as open for pre-emption.

This section of the district contains an extensive body of first-class agricultural land, most of which was purchased from the Government some years ago and is yet undeveloped. The Land Settlement Board's experienced land-cruisers have this year thoroughly examined this area and will no doubt have settlers on the land in due course, as the quality of the soil is excellent, the clearing comparatively easy, and there is an ample supply of good water.

There is a general store and post-office at Palling Station and school at Decker Lake. The main Government wagon-road parallel to the Grand Trunk Pacific Railway runs through this area and settlers have cut their own roads out to it, which makes the whole of this section readily accessible.

SOUTH OF ROSE LAKE.

In this vicinity nearly 3,000 acres were surveyed lying between Rose Lake and previous surveys to the south of the lake. The quality of the land surveyed is as a whole good. With the exception of a few open poplar slopes and willow bottoms, the larger portion of the area is covered with pine, some of which is excellent tie-timber. The soil is good and clearing not too heavy.

It would be well worth their while for intending settlers to look this area over, especially on account of its close proximity to the railway. There are a number of settlers on the land previously surveyed south of Rose Lake and a fair wagon-road leads from the station south. There is a general store and post-office at Rose Lake and quite a few settlers along the main Government road, both east and west of the lake.

EAST OF TOPLEY.

Some 4 miles east of Topley Station 1,600 acres were surveyed immediately north of lots surveyed some years ago, and practically all the latter is held under pre-emption record. The land embraced in my survey is generally good, with some exceptionally good quarter-sections. Practically the whole area surveyed was swept by fire some years ago, which also has the whole area lying north of my surveys, giving it a rather dry and desolate appearance. A considerable amount of the land could easily be cleared.

There is a Government wagon-road running east and west through the lots adjoining my survey on the south which makes the land accessible to Topley Station. The nearest general store, post-office, school, etc., is at Forestdale, some 6 miles to the south. Both the vicinity of Topley and Forestdale has seen quite a number of new settlers this last couple of years and next year will no doubt bring more.

NORTH-WEST OF CHESLATTA LAKE.

The land here is to a great extent open and consists of more or less rolling bench land rising to quite a height above the lake-level. The benches and southern slopes are covered with a luxuriant growth of wild grass, peavine, vetch, cow-parsnip, and fireweed, interspersed by poplar and willow groves. On the higher benches and northern slopes pine prevails and the soil is more sandy. This part of the district is well adapted to cattle-raising, as it affords an excellent range and there is an abundance of wild hay to cut for winter feeding on the extensive open benches. The locality is well watered.

Cheslatta Lake is very beautiful and fascinating and abounds with all kinds of fresh-water fish. Some lots were surveyed fronting on the lake from the west end eastward.

At present this section of the district is not easy of access. By a roundabout route it can be reached by wagon-trail cut out by the settlers, but the shortest route for any one travelling "light" and not afraid of a few mud-holes and windfalls is the old pack-trail by way of Takysie Lake. By the latter route the distance from Francois Lake is some 30 miles. The nearest post-office and school is Ootsa Lake, some 16 miles in a westerly direction.

MURRAY LAKE-UPPER NECHAKO RIVER.

As mentioned above, a trip was made to this part of the district for the purpose of running a tie-line. The country through which I traversed is hilly and rough and densely timbered with pine and spruce of no commercial value. The soil appears to be light and stony. From one high ridge the surrounding country can be seen for miles, and judging by general appearances it contains no arable land and no valuable timber.

South of Savory and Priestley.

South of Savory a couple of quarter-sections were surveyed, being all the unsurveyed land left here suitable for settlement. South of Priestley four quarters were surveyed immediately to the north of the surveys on Tchesinkut Creek and covering the last strip of arable land there.

A considerable amount of the land in this vicinity is held under pre-emption record. Some new settlers have come in this last year, but as yet this locality has not proven its agricultural possibilities, there being but a few acres here and there under cultivation. The nearest post-office, general store, and school is at Endako. The trunk road, which is under construction, to connect the east with the west follows closely to the lines of the area surveyed by me, and when completed will be a great advantage to settlers on these parcels of land.

General Aspect of the District.

The whole of the district is essentially that of one of moderate rainfall, forest areas alternating with open stretches of land generally covered with luxuriant growth of wild grass, peavine, vetch, cow-parsnip, and fireweed. It presents the appearance of a low undulating country with ranges of hills which occasionally rise to an elevation of 500 to 1,000 feet above the level of the larger lakes, generally by easy slopes, while more rarely they are broken and rugged in contour. On the southern slopes poplar and willow groves alternating with open patches prevail and the soil is carpeted with a luxuriant growth of vegetation. The northern slopes are characterized by a greater preponderance of pine and spruce and in certain localities balsam and fir. Pine generally prevails where the soil is more sandy and slopes less prominent. Along the streams and what appears to be ancient lake-beds extensive hay meadows and willow- and spruce-covered bottoms exist. Lakes and small streams abound throughout the district. The elevations of the larger lakes are as follows: Ootsa Lake, 2,740 feet; Cheslatta Lake, 2,800 feet; Francois Lake, 2,375 feet; Fraser Lake, 2,200 feet; Burns Lake, 2,300 feet.

Soil.

A sandy clayish loam is prevalent all through the district, varying in texture from fine silt to coarse granular soil mixed with gravel and sand. Where pine prevails the soil is often more sandy and on the higher benches very stony. In the natural hay meadows and ancient lake-beds a deep vegetable mould overlies the alluvial soil. On the poplar slopes and the willow- and spruce-covered bottoms the soil has a good dressing of vegetable mould varying in depth from 2 to 12 inches, which is generally absent where pine prevails. The great fertility of the soil is evidenced by a remarkable growth of wild grasses, peavine, vetches, cow-parsnip, fireweed, etc., which attain a height of 5 to 6 feet, and grows so densely in places that one can scarcely force one's way through.

Climate.

The climate is one of moderate precipitation. The summer is short, but owing to the long hours of sunshine the rapidity of growth is something almost unbelievable and excellent crops mature throughout the district. The nights are generally cool, with a heavy fall of dew. The winter is not very severe and a remarkable amount of sunshine is experienced. The thermometer registers from 30° to 50° below zero occasionally during the night, but this is the exception rather than the rule. The snowfall varies a great deal with locality and different seasons, but is generally between 1 and 2 feet on the shores of the big lakes and increasing with elevation. Light summer frosts may occur at nights during any part of the summer, but do not seem sufficiently severe to injure the crops. The big lakes generally freeze over by the end of December or early January and open up again the last week of April or the first week in May.

Timber and Mineral Resources.

There are sufficient quantities of mill timber to supply any local demands in the district, and there are also large tracts of pine suitable for railway-ties. Tie cutting camps are located both east and west of Burns Lake. There are sawmills at Fraser Lake, Francois Lake, Ootsa Lake, and Palling.

To my knowledge no minerals in paying quantities have been located inside the district, but there has been great activity both south-west and north, with Burns Lake as a centre. The Taltapin Mining Company is developing a mine some 24 miles in a northerly direction to Burns Lake, which indicates great expectations for the future.

FISH AND GAME.

There is a great abundance of fish in most of the lakes and streams; the species include grey, rainbow, and other varieties of trout, whitefish and other species of fresh-water fish. Fishing is beginning to develop on commercial lines on some of the larger lakes, and will no doubt prove a great source of revenue to those interested in this departure. Small game is generally plentiful and there is a fair number of deer and black bear, with occasional moose and caribou.

FARMING POSSIBILITIES.

Open grass land and meadows can be put under cultivation with little or no clearing. There are extensive lightly timbered areas that are practicable for grazing purposes, as are also the grassy southern slopes of the hills. Timothy and other tame grasses do exceptionally well, while oats, barley, and wheat produced give very good results. Potatoes and other root-crops generally give very satisfactory yields, as does also all garden-truck. Berries and bush-fruits are not grown to any extent in the district, but judging from experiments that have been made they give an excellent yield both in quantity and quality. Strawberries, raspberries, black and red currants, gooseberries, blueberries, cranberries, and saskatoons grow wild in great abundance, and this is probably the reason why so few settlers interest themselves in the growing of small fruits and berries. There is no reason why apples should not be grown successfully in most parts of the district. J. H. Keefe, on the south side of Francois Lake, picked his first crop of apples off his experimental orchard this year; the varieties grown were Transcendents and Red Siberians. Excellent timothy-seed is grown by several farmers, and no doubt great quantities of seed will be grown and shipped from this district ere long. On the whole, the district is eminently suitable for mixed farming and dairying, but the outlying parts, lying too remote from railroads and other modes of transportation, are better suited to stock-raising.

TRANSPORTATION.

Burns Lake, on the Grand Trunk Pacific Railway, is the natural outlet for the Francois-Ootsa Lake District, as also the Babine country. The townsite was laid out by the Government in 1917 and has since then rapidly grown into a prosperous little town. There are two hotels, three general stores, a drug-store, a hardware-store, two pool-rooms, a restaurant, two meat markets, and a garage. The Royal Bank of Canada has an office here, as has also the Dominion Telegraph Line. A branch telephone-line was this year installed to Francois Lake. The Burns Lake two-roomed school has some fifty children in attendance. There is an Anglican Church with resident clergyman, and other items which must not be overlooked are Provincial Police Station and two real-estate offices.

The Public Works Department has shown great activity in this district during the past season, which has improved transportation conditions to a notable extent. A good wagon-road runs south from Burns Lake to Francois Lake, a distance of 14 miles. A free Government ferry operates across Francois Lake and the road continues south-westerly about 24 miles to Ootsa Lake, whence it runs westerly along the north shore of the lake for a distance of about 10 miles to Wistaria, where it connects with the road to Houston, on the Grand Trunk Pacific. The distance from Wistaria to Houston is some 50 miles. The east end of Francois Lake is connected with Fraser Lake Station, on the Grand Trunk Pacific, by a wagon-road some 7 miles in length. From Francois Lake ferry-landing a road follows the north shore of the lake in a westerly direction for some 20 miles to Colleymount Settlement. From the landing on the south shore a road runs south-easterly some 8 miles to the Uncha Lake Settlement. From Burns Lake and paralleling the railway a good road runs north-westerly and connects with the Bulkley Valley Road. There is also a sleigh-road (passable for wagons at certain times of the year) running northerly from Burns Lake to Babine Lake. A new road is being built from Endako to Burns Lake, which when completed will connect the latter with the Nechako Valley and the east. There are a great number of sleigh-roads and trails throughout the district which link the different parts together and allow of ready communication between these and the railway.

At Francois Lake there are two hotels and two general stores, as well as post-office and school. A maternity hospital with resident doctor has this year been opened on the south side of Francois Lake.

At Grassy Plains there is a general store and post-office, and at Ootsa Lake there is an hotel, post-office, and school. Other post-offices in the district are Colleymount, Danskin, Bickle, Wistaria, Palling, Rose Lake, Houston, Endako, and Stellako.

I have, etc.,

V. SCHJELDERUP, B.C.L.S.

FRASER VALLEY, QUESNEL TO PRINCE GEORGE, CARIBOO DISTRICT.

BY J. F. CAMPBELL.

November 20th, 1920.

J. E. Umbach, Eeq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit herewith general report on the surveys made and the country covered by me during the season of 1920. The surveys made were principally isolated pre-emptions and subdivisions of lands reverted under the "Soldiers' Homestead Act." The country covered extended from the Blackwater River, Cariboo District, north to Summit Lake, and on the east and west sides of the Fraser River.

BLACKWATER RIVER.

The Blackwater, a clear, swiftly flowing river, is formed by the junction of the Euchiniko and Nazko Rivers, and flowing eastwards empties into the Fraser in latitude 55° 20′ north. For a distance of 12 miles from the Fraser River (to where the Yukon Telegraph Line crosses the Blackwater) the river flows through rocky, narrow canyons and the valley is narrow. From this point (the Telegraph Cabin) the valley widens to a width of from 2 to 3 miles and is lightly wooded with small pine and poplar. Small meadows varying in size from 5 to 20 acres are scattered throughout the valley. In places, especially on the southern slope, open fir timber is encountered running from 15,000 to 20,000 feet per acre. These patches of fir timber seldom cover more than 20 acres. The land in the valley is level and rises by terraced benches to 400 feet above the river. The country extending to the south is broken by the Telegraph range of hills and no agricultural land in large areas is available. To the north, between the Chilako and Fraser Rivers, is a large plateau, undulating in character, and the timber, principally lodge-pole pine and scattered poplar averaging 8 inches in diameter, is very open. The soil is sandy or clayey and the hollows are swampy, with a growth of heavy willows and alders. The Blackwater River is the northern limit of bunch-grass, and this grass grows in abundance on all open hillsides. Sage-brush was noticed on the northern slope, this being an exceptional distance north for this particular growth. Along the river to the west the country assumes a more open aspect and is ideal for stock purposes. Many ranchers are located on the Nazko and Euchiniko Rivers and are making a success of stock-farming. A short distance from the Euchiniko River is Pelican Lake. There are many large meadows in this vicinity and quite successful stock-ranches are in operation. The snowfall is not excessive, but quite sufficient to supply plenty of moisture for the soil. Cattle will in an ordinary winter feed on the hills all winter, but it is usually the custom to put up a certain amount of hay in case the winter is unduly severe. Hay and grains have been fairly successful, but no great attempt has been made to grow grain on a large scale.

The easiest and quickest way to get into the stock country of the Upper Blackwater is via Quesnel. From this point a road runs to the Nazko River, a distance of 60 miles. The road from Quesnel to Prince George branches at the Blackwater River; one road goes to Fraser Lake, one to the Euchiniko River, and the other to Prince George. At the river is located a telegraph-station of the Dominion Government.

BEAVERLY CREEK.

Beaverly Creek flows north-westerly from West Lake and empties into the Chilako River. West Lake is about 16 miles south from Prince George and the creek crosses the Blackwater–Prince George Road 12 miles from Prince George. The creek is from 30 to 50 feet wide and the current slack. Half a mile north from the lake marshy meadows extend a quarter of a mile on either side of the main water-channel. These meadows are very fertile and support a luxuriant growth of wild grasses. In many places the grass grows to a height of 5 feet. If drained, which I believe could be easily done by breaking some of the old beaver-dams, at least 1,000 acres of meadow land lying along the creek, between the lake and the road, could be made excellent

agricultural land. The land on either side of the meadows is open poplar with plenty of grass for grazing purposes. Farther along the creek on the west side of the road are a number of farms that have from 50 to 100 acres under cultivation. The road from Prince George parallels the meadow land half a mile to the west, and there are a number of roads branching off the main road and running west to the farms in operation.

CHILAKO RIVER.

The Chilako, locally called the Mud River, is a sluggish stream meandering through a narrow valley. The valley nowhere exceeds half a mile in width, but the land in the bottom is exceptionally fertile. The river empties into the Nechako River about 25 miles above Prince George. For 20 miles from its mouth it is well settled and the majority of the farms are producing excellent crops. The valley is level and wooded with cottonwood, spruce, and alder. There are patches of meadow that can easily be increased to a considerable acreage by very little clearing. The clearing of the large cottonwood and spruce stumps is rather hard, but can be made much easier by the use of powder, something that has not been used to any great extent in this area. The open patches produce a luxuriant growth of wild grasses, with a good sprinkling of vetch mixed in, making a very high-grade feed, which is preferred to timothy by dairymen. The price of hay ranges around $30 to $40 per ton, the yield being about 2½ tons per acre. Alfalfa grows well, yielding from 1½ to 2 tons per acre, and can be cut twice and the field pastured. Red clover, alsike, and other clovers grow well. Timothy in the rich bottom lands grow from 3 to 4 feet in height and yields from 2 to 4 tons per acre. Brome-grass, which grows about 5 feet high and then falls down, can be cut twice in a season and the field pastured. The soil in the valley is a sandy silt, built up of different kinds of earth, with a large percentage of decayed vegetation and mould of different kinds, and is very rich and productive, so rich that farmers are inclined to seek the short- and strong-strawed varieties of barley, oats, and wheat so they will stand up to mature. Potatoes, beets, mangels, etc., all do well under cultivation.

The valley is surrounded by bench land with a sandy or clayey soil, and some settlers prefer it to the valley lands. The timber on the benches is a light-growth poplar and clearing in the majority of cases is fairly light. There are large stretches of good land to the west of the river, between the Telegraph range of hills and the river. There are good roads to the Chilko River. The main wagon-road from Prince George to Fort Fraser crosses the river a few miles from its mouth. A good road branches here and continues up the river for about 15 miles. A school is located in the valley and the settlers hope to obtain a post-office shortly.

EAST OF FRASER RIVER.

The country on the east side of the Fraser along the line of the Pacific Great Eastern Railway, now building, is being rapidly settled. Most of the country has been burnt over and second-growth poplar and willow is the principal growth. Where not burnt the timber, spruce and fir, is fairly heavy and a number of small sawmills are in operation, supplying the settlers with building-lumber. Most of the farmers are within a few miles of the Fraser River, and although there is no road communication they are able to haul their produce to the river and then by steamboat to the market. A road, Prince George–Quesnel, is now building on the east side of the river, and this, with the completion of the railway, will aid the farmers enormously and bring them within a few hours of a ready market.

From Fort George Canyon south the winters are noticeably less severe and the snowfall lighter than a few miles farther north. This has induced many settlers to locate in this area. The crops are generally excellent; the wheat especially noticeable for its heavy yield per acre.

WEST OF FRASER RIVER.

The country paralleling the river on the west side and extending back a few miles is more or less rough and broken. The whole country has at one time been burnt and is now wooded with small poplar and willow. There are many patches that escaped the fire, and green timber, generally spruce, grows to a diameter of 30 inches. In places the river-bench is about half a mile wide and practically open, with very little timber except a few cottonwoods. These river-flats are excellent in every way and are noted for their heavy crop-producing qualities. The bench from the river-bottom to the top is about 250 feet high, and the country for a few miles back is usually very broken, the soil being either very sandy or gravelly. There are exceptions to this, and in places a few hundred acres in extent the land is all that could be desired. The

country is well watered; the creeks, however, generally being in deep gullies. These gullies run back from the river about 2 miles, when the top of the bench is reached.

A road parallels the river about 10 miles to the west and is in fair condition for loads not exceeding 1,500 lb. A few sleigh-roads branch from the main road and runs towards the river. With very little labour these could be put in first-class shape.

Timber.

Lumbering is one of the principal industries of this area. Many sawmills are located along the line of the Grand Trunk Pacific and give employment to thousands of men in the open season. No doubt, when the Pacific Great Eastern Railway is completed south from Prince George, many mills will be located along the line, as there are large areas of merchantable timber paralleling the Fraser River that can be profitably cut. There is a great deal of timber that is not satisfactory for lumber, and I have no doubt that in time this will be converted into pulp, for much of the waste or scrub timber that is at present wasted can be used by pulp-mills.

Transportation.

The country is gradually being opened up by new roads or else improving the existing roads. The past year, due to the heavy and unexpected rains, has been very hard on the roads, and in many cases a road that has for years given satisfaction has this summer been turned into a quagmire. A new road is now building from Prince George to Quesnel, and this will give the settlers on the east side of the Fraser River direct means of transportation between both towns. The Pacific Great Eastern Railway is also under construction and will shortly be in operation between the Coast and Prince George.

Climate.

Winter may be considered to last from November 15th to April 15th. Some years winter sets in early, and in other years, like the present year, after a stretch of cold weather in the later part of October and early November, the temperature rises and bright sunny weather lasts until well into December. The average snowfall is from 2 to 3 feet and this quickly disappears in the spring. The average mean temperature for the winter months is about 22° F. above zero. The average summer and fall temperatures and rainfall for the years 1916–17–18 are given here:—

	Temperature.	Rainfall in Inches.
June	56	1.34
July	57	2.37
August	58	1.44
September	52	0.79
October	42	1.49

Minerals.

There is very little mining activity in this area. On Stone Creek and Hixon Creek, both on the east side of the Fraser River, there are two small camps that are working on quartz-gold prospects. Farther up the Fraser, near Giscome Portage, considerable work has been done on a claim held by O. Eden, and very good results have been obtained, especially from galena indications. On the Blackwater River, near the present Forest Ranger Station, there are indications of coal. In one place a seam about 18 inches wide is exposed, the coal being a shaly nature. Most of the rock in the vicinity of the Blackwater River is marked by iron-rust, and in one or two places low-grade galena was noticed.

Game and Fish.

The game, especially near the Fraser River and on the benches close to the river, is very plentiful. Moose and deer are in abundance and it takes very little skill as a hunter to obtain a supply of fresh meat. Bears are very numerous, many of the settlers having considerable damage done to their berry-crops by the black bears. Fish are also plentiful, and there is hardly a stream or lake that will not supply a good catch of trout.

I have, etc.,

J. F. Campbell, B.C.L.S.

PEACE RIVER DISTRICT.

BY A. R. BARROW.

POUCE COUPE, B.C., November 16th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—The country to the south of the Dominion Peace River Block is drained by the South Pine River and by the Kiskatinaw, which is shown on old maps as Mud River, but is known locally as the Cutbank. The West Branch of the Pine, heading in the Pine Pass, is usually considered to be the main stream, although the volume is little larger, if any, than that of the Sukunka (Middle Fork) or of the Murray (East Pine). These various branches are all mountain streams, whose volume is determined more by the melting snow at the headwaters than by local rainfall. The current is swift, but in low water good canoemen can pole up; it is probable that stern-sheet steamers could ascend from the Peace during two months of high water as far as the confluence of the West Pine and Murray. There is a difficult canyon in the West Pine, some 12 miles above the forks, and others far up the Sukunka and East Pine.

A new and interesting feature of the East Pine is a landslide below Wolverine Creek, which occurred in August. This slide blocks the entire width of the river-bed, about 350 feet, and is as long up and down stream. The river is diverted through the timber into what was a meadow of wild hay.

Generally the rivers are extremely crooked, running between cut-banks, and leaving considerable flats at the mouths of the creeks.

The Kiskatinaw heads in some marshes and is comparatively sluggish. A feature of all these rivers and the tributary creeks is the great depth of the valleys as they approach the mouths. Ascending the creeks, one finds small areas of open land with excellent soil, but nowhere is there room for a settlement of more than 100 to 200 people without clearing off the timber. Excluding these fertile areas up the creeks and the flats at their mouths, with occasional narrow strips in the river-valleys, the country is occupied by mountain ranges of no great elevation, the highest summits being between 5,000 and 6,000 feet.

The largest of these small areas for settlement is the group of lots known as the Burns Block, situated near the south-west corner of the Dominion Peace River Block. This land can be reached by canoe from the Parsnip River up the Misinchinka; the portage at the Pine Pass is about 7 miles long. An alternative is to descend the Peace to the Rocky Mountain Canyon; from thence by wagon-road 14 miles to Hudson Hope, from which there is a good pack-trail of 40 miles. An easier but more circuitous route from other parts of the Province is by railway to Edmonton and Peace River; thence by steamer to Hudson Hope. The only practicable way to bring in machinery or heavy freight is by railway to Spirit River; thence by wagon-road to the East Pine Forks, 113 miles, and 60 miles up the West Pine River on the ice, which serves for several weeks between January and March. The nearest town, post and telegraph offices, and school are at Hudson Hope, 40 miles.

There is no settlement on the Sukunka River; on the East Fork there are small communities at Cowic (Prairie) and Wolverine Creeks. From Prairie Creek, the nearest town, post and telegraph offices and schools are at Pouce Coupe, 72 miles, where there is also a Government Agent, exercising all the numerous functions of his useful calling. The route from Pouce Coupe is by wagon-road to East Pine Forks, 53 miles, and a mountain pack-trail of 19 miles. As on the West Pine, the East Fork and Prairie Creek serve in winter for heavy transport. The countour of the land lends itself to the eventual construction of a shorter road, eliminating the mountain trail.

To Wolverine Creek from Pouce Coupe is 80 miles by a poor trail, and 180 by the winter road from the railway at Spirit River, by East Forks, and thence on the ice.

The very indifferent railway service afforded by the Edmonton, Dunvegan & British Columbia Railway is likely to be improved by the Canadian Pacific Railway Company, which now operates the road; but settlement on any considerable scale cannot be expected until there is direct railway connection with the rest of the Province. At present the sources of supply are necessarily in Alberta.

The only industry in the district under consideration, apart from farming—or rather developing farms—is trapping, which fluctuates with the price of fur. It will necessarily

decrease with settlement, but at present it is sufficiently important to bring fur-buyers to all parts of the district.

On the open areas up the creeks, as among the scattered poplar and willows, the soil is a rich black loam from 2 to 10 inches deep, with a sandy clay subsoil. On the flats in the river-bottoms the soil is similar but lighter, with gravelly subsoil. Wheat ripens and oats are a sure crop, but as no threshing is possible with the present means of transport, the wheat is useful chiefly for chicken-feed and the oats for green feed to cattle and horses. Excellent potatoes are grown, but a judicious choice of location is necessary to insure them against frost. All the ordinary garden vegetables do well in the short but hot summer, and there is a variety of wild fruits which, excellent as they are, improve by cultivation. The open spaces afford good wild hay, red-top predominating, and where the meadows can be irrigated they can be cut apparently year after year.

Seeing that the settlement areas are small, and apart from the present want of transportation, it is probable that profitable wheat-raising cannot be expected; and as cattle must be fed in winter, the conditions point to mixed farming as the most likely industry. The period of winter feeding can hardly be determined in the absence of records extending over several years. In 1919 feeding was necessary from October 20th, but this year there is still good grazing in the middle of November. Range horses will feed through all but the hardest winters.

The same absence of records makes it difficult to write anything definite of the seasons. Generally speaking, there is a cold dry winter, with less snowfall than in many parts of Southern British Columbia, and there are occasional Chinook winds, which clear the snow off the open spaces. The summers are short and warm, and the rainfall, which may come in any month, amounts to a short rainy season before or after the hot weather. Summer frosts affect the benches more than the river-flats, but on the smaller creeks the reverse is said to be the case.

Grizzly bears are not rare, but getting farther from the settlements; black bear and moose are plentiful and there are some caribou on the higher reaches of the river. Timber-wolves are occasionally seen, but no damage by them has been reported. Coyotes are few and no goats or sheep are found. Beaver are increasing with the protection afforded them. Of fur-bearing animals, there are also fox, marten, wolverine, and lynx.

Whitefish are plentiful in Rocky Mountain Lake, the only considerable lake in the district. Grayling are the most generally distributed fish. There are large bull-trout up to 10 lb. in the rivers of the Pine basin, and rainbow trout, the latter not plentiful. In the Kiskatinaw there is an absence of edible fish.

I have, etc.,
A. R. BARROW, B.C.L.S.,

FRASER VALLEY, QUESNEL TO SODA CREEK, CARIBOO DISTRICT.

BY E. J. GOOK.

QUESNEL, B.C., November 26th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to report on this season's survey operations, which consisted chiefly in the survey of scattered pre-emptions recorded throughout that portion of the Cariboo District lying from Soda Creek north and east of the Fraser River. Some of these records were of long standing, and with the exception of two, which were temporarily inaccessible, and a few unoccupied and unimproved not considered suitable for settlement, the area above mentioned is now clear of pre-emptions recorded on unsurveyed land. Any vacant Crown land found suitable for agriculture was surveyed into quarter-sections, and in many cases settlers were waiting to take them up. Sections of land previously held under application to purchase, but now lapsed to the Crown, were subdivided by being cut into quarter-sections.

The physical characteristics of the large area covered by these many small surveys may be described as a long strip of land about 25 miles wide running north and south between the Fraser and Quesnel Rivers, with the latter's tributary, Beaver Creek, both of which flow to the north, whilst the Fraser River flows to the south. This strip of land rises from each river-valley in varied slopes with benches, forming on top a plateau, in parts broken up by creeks,

meadows, and swamps which drain to their respective valleys. This plateau attains a maximum elevation of about 3,000 feet above sea-level, although there are peaks about 500 feet higher.

Transportation is favourable and varied: Steamboat service on the Fraser River between Soda Creek and Prince George. Roads down each valley, with several crossing over between each. Rail service is provided by the Pacific Great Eastern Railway, the steel of which is rapidly approaching Quesnel, and its operation will no doubt produce addition and improvement to the wagon-roads as feeders thereto.

The area under report is adjacent to the famous Cariboo gold-mining district, Barkerville, Keithley Creek, Hydraulic, etc., and a revival of the mining industry will undoubtedly resuscitate its agricultural development.

There are several small areas of timber that the advent of the railway will render marketable, but there is insufficient to promote the lumber industry to any great extent.

To characterize generally the soil of such a large area as that operated in this season—some 2,500 square miles—might be misleading to settlers unacquainted with the changing variety of soils met with in the Upper Country of this Province, so this feature has been dealt with later on in reporting particularly on the localities in which surveys were made. Being an old-settled district, the possibilities for farming and stock-raising have been long established, and the vigorous policy of removing encumbrances from unoccupied and unimproved surveyed land is beginning to transform into *bona-fide* settlers' homesteads pre-emptions hitherto looked on as santoria by jaded trappers and prospectors. The combination of meadows and pasture land with creameries (one already established by the Government) and a convenient railway form an optimistic prospect indeed.

The timber on lands suitable for cultivation is not heavy, and consists for the most part of scattered poplar, small spruce, and upland willow, amongst which wild grasses, peavine, and vetch grow in profusion. Open fir, occasionally reaching 3 feet in diameter, prevails on hill-sides, and sufficient timber for building, fencing, and fuel can be depended on everywhere. Many parts have been burnt for a number of years and the second growth consists of light poplar and willow. With the present high prices of labour, etc., the cost of clearing is hard to estimate, but from $30 to $50 per acre might be taken as some indication. Bearing in mind the corresponding increased value of a resulting crop, with hay at $50 to $80 per ton, clearing is undoubtedly profitable.

The climate is moderate. Summer from May to September. Warm days with cool nights, with the possibility of light summer frosts which may affect garden crops only at the higher altitudes. In the lower valleys there is practically little risk. This fall was exceptionally wet, rain prevailing from about September 9th for a month, delaying the getting-in of hay and affecting roads. To date there has been no snow and the weather has been very mild.

Moose, deer, and bear signs are numerous. Grouse are plentiful, whilst trout abound in streams and lakes, particularly Mud (McLeese) Lake and Big Lake.

SODA CREEK.

Several pre-emptions were surveyed on the high ground north and east of Soda Creek on the other side of a ridge of timber which separates McLeese Lake from the Fraser River. One, unoccupied, consisted of a strip of spruce bottom interspersed with small meadows on the Alexandria–Beaver Lake Road, some 9 miles from Soda Creek and 2 miles from the Pacific Great Eastern Railway. The valley in which this is situate looks as if at one time it might have been the outlet for Sheridan Creek. There is an old mining-ditch dug by Chinese along this valley to the Fraser River which is still in a fair state of preservation. The bottom land surveyed is black muck soil, but clearing will be heavy, as there is a dense growth of spruce and willow. A few clean spruce up to 14 inches are to be found. There is no other agricultural land adjoining. Southward the ground rises to the timber ridge above mentioned. Northward it rises in stony burnt-over slopes covered with light poplar to a bench which extends towards Cuisson Lake and the headwaters of Cuisson Creek. On this bench the growth is very open poplar up to 10 inches, with scattered bluffs of spruce. In parts there is a good black soil from 6 to 12 inches in depth, beyond which the soil is mixed with small sharp pieces of stone. At present this affords good range, but it should be easy to clear and cultivate. There are a number of sloughs and meadows on this bench. One such had been staked as a pre-emption and was surveyed. It lays about three-quarters of a mile directly north of Mud Lake. There is a steep shale-slope from the bench to the lake, but eastward about a mile up Sheridan Creek a

good grade has been used to cut a hay-road. The meadow could be drained and when cleared of willow should afford 30 acres of hay land.

Another old pre-emption surveyed consisted of a meadow with a good deal of willow, about 5 chains wide, along Soda Creek, some 8 miles east of the village of that name. There is excellent summer range in the vicinity but apparently little use is made of it.

Beaver Lake–Alexandria Road.

This road leaves the Cariboo Road at Mile-post 177, some 12 miles north of Soda Creek. At present it is only a second-class road, but as it is the shortest way to the railway from the Beaver Lake–Quesnel Forks country it will no doubt increase in importance. Toward Beaver Lake a number of settlers have taken up land, and a block of three lots was surveyed on Whitestone Lake, 12 miles west from Beaver Lake. The elevation is 2,600 feet, but the land is easy clearing and there are many open spaces that would stand cultivation. Around the end of the lake to the south about 20 acres of wet slough was included in one lot. By cutting out beaver-dams at the north end of the lake it could be sufficiently lowered to transform this area into meadow land.

About 6 miles north-west of Whitestone Lake and west of Fredy Creek a lot was surveyed consisting of a meadow at the foot of what was named Philemon Lake. This place had been squatted on and hay cut some years ago. A returned soldier was prepared to take it up.

Beaver Lake.

From Whitestone Lake to Beaver Lake the road runs along what is known as Peavine Ridge, and two lots were surveyed here for waiting pre-emptors, one of whom had commenced improvements. The soil is black and when cleared of open poplar should prove profitable to cultivate. Close to Beaver Lake the ridge has been burnt and there is a growth of small poplar. The soil becomes lighter and more stony, but should afford good pasture for the valley holdings, especially for sheep, which are on the increase in this part of the country. There is good water on the ridge; the elevation averages about 2,600 feet above sea-level.

Big Lake.

Six pre-emptions were surveyed at the east end of Big Lake. Most of them have been reported for cancellation, as they appear to have been abandoned. These lots are strung out along a chain of lakes which drain into Big Lake, which latter drains to Beaver Creek. The elevation is about 2,500 feet and the growth is fairly open and clearing not difficult. The surface is undulating and the grassy slopes afford good pasture. It is well watered and the soil varies considerably from black peaty muck in the portions of willow bottom to gravel on some of the ridges. The medium-coloured loam soil that prevails should, when the land is cleared, be suitable for the cultivation of grain, as has been successfully demonstrated on similar land around Big Lake. There must have been good crops produced in that neighbourhood at one time, but the cultivated lands lying idle evidence the general complaint against the high cost of and the uncertainty of labour that is hindering agricultural production.

One pre-emption was surveyed at Marguerite Lake, some 6 miles from Big Lake on the road to Soda Creek. It lay between two occupied holdings, and although improvements had been started it had apparently been abandoned. Good oats and garden produce were raised on adjoining land, and the country affords good range.

Kersley.

Three lots were subdivided at Kersley, some 12 miles south of Quesnel on the Cariboo Road, where there is provision for a railway-station. Each quarter is held under pre-emption and most of them are occupied and being improved. The soil is a good loam and clearing is not heavy, most of the country having been burnt over and the second growth is but light poplar. This place should become a thriving settlement.

Cottonwood.

Three miles north from the 10-Mile House on the Quesnel–Barkerville Road a small meadow held under pre-emption was surveyed. Slough-hay had been cut on it during past seasons, but it had not been occupied for some time.

Two miles farther north on the Cottonwood River a good piece of bottom land was surveyed. The only present means of access is by trail, but a road is being cut. Good garden produce is

raised and washing for gold appears to be profitable. There are several mining prospects at various points on this river receiving attention.

North of the river the country rises to a lightly timbered bench that extends north and west to the North Fork of the Cottonwood River, indicating a favourable extension eastward in time of the surveys at present existing from 10-Mile Lake north.

Another record was surveyed at the junction of Boyd (Chisholm) Creek and the Cottonwood River, some 3 miles below the Quesnel–Barkerville Road Bridge and Post-office. It is reached by means of the Allbau Lake and Willow River Trail. The lot comprised about 35 acres of river-bottom, with a silt soil timbered with scrub spruce and cottonwood. The balance is poplar side-hills. There did not appear to be much agricultural land in the vicinity along the river, and the plateau above is high, with stony and gravel soil.

On the Quesnel River, about 5 miles south from the 13-Mile House on the Barkerville Road, was a pre-emption staked on an abandoned mining claim. The soil is silt along the river and produces grain and vegetables. The side-hills with several small benches slope to the south and should raise hay.

There appeared to be a stretch of poplar bottom on the other side of the river opposite worth surveying, but the river was too high to cross for a closer inspection.

QUESNEL RIVER.

At Sardine Flats, 17 miles from Quesnel, on the road to Hydraulic, an additional area was surveyed to a pre-emption and one full lot subdivided. Several settlers have taken up land in this vicinity the last year or two, and more land suitable for settlement could be found from here up to Beavermouth and on to Beaver Lake. One or two wanted to take up land in the vicinity of Joan Lake, but it was found impossible to survey same on this season's schedule.

On Beedy Creek, a tributary to Beaver Creek, one pre-emption was surveyed. There is a good piece of poplar bottom partly burnt over along the creek, but the valley here is narrow and there is not much bottom land available. On the bench above the creek there are several open patches with good soil. It is well watered. There is no road at present connecting Ben Lake with Beavermouth, only a trail, but one will undoubtedly be opened ere long.

COTTONWOOD CANYON–FRASER RIVER.

Three lots were surveyed here on a level bench overlooking the mouth of the canyon about 150 feet above the Fraser River. A road to the Tertiary Mine passes through each lot. It is understood that this project, on which considerable money has been spent, has only been temporarily suspended, and its revival should make these lots attractive for settlement. The steamer plying between Prince George and Soda Creek has a stopping-place half a mile away. The growth on these lots is light poplar, pine, etc., with peavine and vetch. The soil is sandy loam in places, in others a good dark loam of from 2 to 3 feet in depth. The subsoil is gravel. There is a small creek that runs from a muskeg through willow bottom, eventually reaching the Fraser River.

SIX-MILE LAKE.

Eight full-sized lots were subdivided here. There is every prospect of a good settlement at this point, as it is only 6 miles from Quesnel and the land is comparatively easy clearing, a greater portion of the area having been burnt over about ten years ago. The elevation is about 2,400 feet above sea-level and the soil varies, being chiefly a clay loam over clay and gravel subsoils. The growth is poplar, pine, spruce, birch, etc., with many patches of willow bottom. It is well watered and to the north there is a large muskeg. Grain and vegetables are raised successfully on adjoining holdings. There are a number of pre-emptions recorded on the various quarters, but only one is doing anything, and the others are in line for cancellation proceedings. There is good summer range, but on account of the deadfalls in the burnt-off portions it is difficult for stock to gain access thereto.

I have, etc.,

E. J. GOOK, B.C.L.S.

QUESNEL AND CARIBOO LAKES, CARIBOO DISTRICT.

By Rupert W. Haggen.

Quesnel, B.C., November 14th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I beg to submit the following report in connection with surveys made during the past season:—

The first work undertaken was a small survey near Soda Creek, after which I moved to Harpers Camp, surveying one parcel which was suitable for settlement near the mouth of Horsefly River.

The main work consisted of a triangulation of Quesnel Lake, with ties to surveyed timber limits thereon, and a tie to limits on the Upper Clearwater. Upon completion of this I made a tie from existing surveys in the vicinity of Quesnel Forks to Keithley Creek, surveying two parcels of land on Cariboo Lake and plotting in the lake. The final work was the survey of three parcels of land, two of which were held by returned soldiers, on Maud and Victoria Creeks, in the section of country lying between Quesnel River and the Cariboo (Barkerville) Road.

These three sections have not heretofore been dealt with in surveyors' reports. For a number of years I have heard tales of the great timber wealth of Quesnel Lake, and from the number of limits staked there some fifteen years ago one would naturally assume that there must be a splendid body of virgin timber. It was a decided disappointment to find this was not the case. Looking at the hillsides from the lake, one sees a dense forest of cedar, spruce, and hemlock, the trees ranging from 18 inches to 4 feet in diameter, so that, from a casual glance, a cruise of from 10,000 to 20,000 feet per acre might reasonably be anticipated. Upon closer inspection it is seen that the tops of the trees, especially the cedar, are dead; and it is strange, but nevertheless true, that practically all the timber is hollow along the entire length of the lake. I do not think that any of the cedar is suitable for logging, as the shell is rarely over 6 inches thick; while a dry-rot appears to develop in the heart of the spruce and hemlock. Whatever timber is available will be of the latter varieties, with patches of fir. I would not care to hazard a guess as to what merchantable timber there is in the aggregate along the lake. The cruise per acre would nowhere be high, though, and it is doubtful whether, with the amount of cull existing, logging could be carried out profitably. I do not know what is the cause for this peculiar condition; it can hardly result from insufficient rainfall or from climatic conditions—the altitude of the lake is only 2,250 feet; possibly some necessary ingredient is lacking in the soil. A botanist might be able to deduce the cause; unfortunately the effect is beyond human remedy. This condition seems to be quite local, confined to Quesnel and Horsefly Lakes, as the timber on the Clearwater slope, and also on Cariboo Lake, is of good quality.

The shores of Quesnel Lake are everywhere hilly, the mountains rising only a few hundred feet at the westerly end; on the North Arm they rise to an altitude of about 7,000 feet, while on the East Arm they attain in the Clearwater Mountains an altitude of 8,500 feet, the summits being snow-capped and a few small glaciers being visible. The mountain scenery at the head of both the North and East Arms is beautiful, though it has not the rugged grandeur of the Rockies; the Clearwater Mountains compare with the Gold Range in altitudes and general appearance.

There is no agricultural land along the lake above Horsefly Bay, though the few trappers who live there have nice garden-patches in pockets of rich loam. During the past few seasons splendid catches of fur, chiefly marten and beaver, have been made. The prevailing high prices of marten have enabled these men to live comfortably. Trapping is the sole means of livelihood, as, although considerable prospecting has been done at different times, no mines have as yet been discovered. Considerable work has been done on one property on Big River, a tributary of the Clearwater, but it has not been proved. So far as I have been able to see, the prospecting done heretofore has been rather haphazard and insufficient to afford any knowledge as to whether the country is mineralized.

There are two water-powers available along the lake; the best of these would be developed from the dam across the outlet of the lake. Niagara River, near the head of the East Arm, has a flow of 1,000 cubic feet per second, and at the edge of the lake has a fall of 130 feet. This waterfall comes over the upper portion of the rock wall in one body, then divides into five

streams, and is indeed a pretty picture. However, as a practicable water-power it is too remote to be of value. There are also smaller powers available on Roaring River, Grain Creek, and Skookumchuck Creek, on the North Arm.

As a pleasure resort the lake is spoiled to a considerable extent by having a dam across the outlet; the gates in this dam are of insufficient size to carry the high water, and as a consequence the lake-water extends into the timber along the shores for a considerable portion of the summer, covering the beaches and continually washing away the soil from the roots of the trees, these falling and lining the shores of the lake. In the fall, when the water drops, there are some nice beaches along the main lake and the North Arm. The East Arm is more precipitous, the sides of the lake being steep and rocky, with few places at which it is practicable to land a boat in stormy weather; and for a surveyor making a triangulation survey a very difficult place to get stations. It was sometimes necessary to take the stations not where most desirable, but in any place where it was possible to land and set an instrument.

The East Arm is a bugbear to most people who have travelled the lake. Until this year none of the trappers had boats that were suitable for lake-work, and the lake is inclined to be stormy at all seasons. On the East Arm there is nearly always a wind sweeping through the gaps in the mountains, and terrific storms will develop in a few minutes, giving no time to reach shelter; the precipitous shores sometimes afford no landing-place for several miles, and it is not to be wondered at that those who know the lake best are always in a hurry to get through that portion lying between Hurricane Point and Niagara. However, with a good boat there is no occasion for getting into difficulties.

Quesnel Dam is renowned as a fishing resort and several well-known people come there each year after the trout. In the lake itself there are plenty of fish, varying in weight from 2 to 30 lb. There are a few bear, deer, and moose, but it is not a game-hunter's paradise.

Quesnel Lake is accessible from the 150-Mile House or Williams Lake, or Quesnel, by road, and cars can be taken to the dam. There are four motor-boats on the lake now. From the head of the East Arm a good trail leads to Upper Clearwater Lake, 6 miles away. There is only a low pass, about 200 feet in height above Quesnel Lake, between the two lakes.

Considerable areas of forest have been destroyed by fire; after every thunder-storm some fires start and the accumulated burns are now of considerable area.

KEITHLEY CREEK, CARIBOO LAKE.

Keithley Creek, the original "rich diggings" of the Cariboo, lies 17 miles from Quesnel Forks, on Cariboo Lake. I traversed the road from the existing surveys to Keithley Creek, and also traversed Cariboo Lake sufficiently to plot it. As is usual in this locality, there is very little arable land, the country being mountainous, and the only land suitable for crop production being on the old wash at the mouths of the creeks. The largest of these deltas is that at the mouth of Keithley Creek, where Robert Borland, a pioneer of 1861, himself conducts a store and ranch. He raises some 30 tons of hay annually and always has a good crop of vegetables, Keithley potatoes being famed locally for their excellence, and this in a district that declines to take second place to Ashcroft as a producer of mealy tubers. Vegetables grow well on the Borland Ranch. Frank Hunter, a returned soldier, has a place at the mouth of Goose Creek, across Cariboo Lake from Keithley Creek, where he also raises a good garden crop. One drawback to farming in this section, however, is the high cost of clearing land; the growth is very thick, large spruce-trees rising from a tangle of alder and red willow, while there is a very limited local market for produce. At the present time, with the Kitchener Mine doing considerable construction-work, there is a brisk demand, but ordinarily the market is limited indeed.

From Quesnel Forks the Keithley Road, really a widened trail only, follows the North Fork of Quesnel River, of which Cariboo Lake is a widening. There is a nice-looking body of timber, consisting of cedar, spruce, fir, and hemlock, on the south side of the river, this extending into Coquette Pass and on to the mountain between the North and South Forks. There is also good timber on Cariboo Lake and, I am informed, along the river above the lake. It seems to be of good quality, the trees where cut being generally solid; there would not be the high percentage of cull in this section that there would be on Quesnel Lake.

The natural outlet for this timber would be via the Quesnel River to Quesnel, on the Pacific Great Eastern, and sixty-five miles distant. At the present time the question of necessary river-improvement for driving logs is being investigated.

The sole industry at Keithley Creek is hydraulic mining. The creek has been a good producer and at present work is progressing on the Kitchener Mine. Heretofore this ground has been worked as a drifting proposition, but now a large water-supply system is being constructed. From Keithley Creek trails run to Harvey Creek, where a mine was at one time operated and also up the Creek to Snowshoe Creek, and thence to Barkerville. The miners who live around Keithley have faith in the camp—no man would be in a mining camp if he did not—and there is always a certain annual production.

A few years ago some pre-emptors staked swamp meadows at the head of Cariboo Lake. However, these were never occupied, and I do not consider that they are suitable for settlement, owing to the long duration of flood, lack of accessibility, and impracticability of draining them for cutting hay. They are very boggy and the sedge-grass on them is of very poor quality. I did not feel justified in surveying these as lands suitable for settlement.

Climatically, Cariboo Lake has much heavier precipitation than Quesnel Lake or the Quesnel Valley, the snow being deep every winter and usually lying for over five months.

Cariboo Lake and the North Fork of Quesnel River are good places for big game, moose and caribou being very plentiful. The former are easily hunted with boats, while the caribou are usually high on the hills. Beaver appear to be numerous. I do not know how the fur-catches have been latterly, but marten would in all probability be quite plentiful. Bear and moose are frequently in the field at Mr. Borland's; in fact, one moose made the ranch her home this spring and summer. The moose is as tame as the domestic cow during a considerable portion of the year, and about as interesting to hunt. The photographer will be able to get some genuine sport and some very interesting big-game pictures in this locality or at Bowron Lake, near Barkerville.

Cariboo Lake is very poor for fish. There are falls on the river that seem to be impassable and prevent them reaching the lake.

The mountains around Keithley Creek extend to an altitude of about 7,000 feet, the summits being above timber line and generally rounded and easy to travel. There is a post-office, with a weekly mail service at Keithley Creek.

Maud and Victoria Creeks.

Some 12 to 15 miles along the water-conduit from Swift River to Hydraulic there are numerous patches of open hillside where the soil is a rich loam; these hillsides facing to Chiaz, Maud, and Victoria Creeks. One settler, Alfred Sundberg, has built a good home on Victoria Creek and raises 30 to 50 tons of timothy-hay annually.

A road runs from Hydraulic to Sundberg's and also to the dam on Swift River; a trail leads to Maud Creek, thence to Quesnel Forks; another trail leads from Victoria Creek to Cottonwood, 27 miles distant on the Barkerville Road, and a third trail, now fallen into disuse, from Swift River to Stanley.

The section is subject to severe summer frost, some years proving fatal to the potato-crop, but hardier vegetables are grown successfully. There is sufficient precipitation to make irrigation unnecessary.

However, it must be borne in mind that the locality is remote; there is no dependable market available, and it is not a locality that is suitable for agriculture under present conditions. Stock would do all right, but there would be a long season in which to feed, and a hay-crop of 1½ tons per head would be necessary. There is excellent summer range, a luxuriant growth of grass and vetches covering the country. At the present time the moose is making good use of it, and we saw moose every day in the locality.

Owing to the floods—the creeks exceeded the spring level—I was unable to get to Redwater Creek to survey a pre-emption there. Swift River and Victoria Creek were both in high flood.

In general, the past season has been a busy one in all lines of work in the district. Unfortunately the heavy rains in the fall were responsible for severe crop losses among the farmers and a sudden drop of about 25 per cent. in the price of beef was felt severely by the stockmen.

With the opening-up of the Cariboo by the Pacific Great Eastern Railway, outside markets are becoming accessible, and the necessity of producing finished products in the industries for which the district is suited is apparent.

A creamery has been erected in Quesnel, to be operated under Government supervision during the coming year, and through the arrangements of the Department of Agriculture the settlers have been enabled to obtain dairy stock. Dairying as the base of mixed farming is thus given an opportunity to develop, and the district is well suited for it. If this proves successful, presumably other dairies will be erected and an inducement thereby given to settlers throughout the district to produce and make good on their places. A number of returned men have taken up farms in the Cariboo under the Soldier Settlement Board and are doing well. Agriculture and stock-raising will be the permanent industries employing most people; mining and lumbering will undoubtedly also develop to a certain extent.

I have, etc.,

RUPERT W. HAGGEN, B.C.L.S., D.L.S.

NAZKO AND CHILCOTIN VALLEYS, CARIBOO DISTRICT.

BY W. C. MERSTON.

VICTORIA, B.C., October 26th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the surveys made by me in the Cariboo District during the past season:—

Early in June I proceeded by way of the Pacific Great Eastern Railway to Quesnel. The journey was interesting from a pioneer point of view, but at that time speed was a secondary consideration. I outfitted at Quesnel, hiring local men for team and axe work. My party left Quesnel on June 3rd and spent the first month surveying wild-hay lands around the headwaters of Baker Creek. The second and third months were spent surveying grazing lands in the Nazko Valley, and the last month, September, was devoted to running tie-lines in the Chilcotin country. In all, 3,311 acres and 56 miles of tie-line were surveyed, and topography was taken over 2,000 square miles of country.

THE HEADWATERS OF BAKER CREEK.

About 25 miles from Quesnel, on the Nazko Wagon-road, a branch road forks to the south, passes by Quandstrom's pre-emption (Lot 9506), and runs to Tibble's Pre-emption (Lot 9511). From the south-east corner of the latter lot I commenced my season's work.

The country between Tibble's pre-emption and the headwaters of Baker Creek consists of a plateau some 12 miles long by 8 or 9 miles wide. This plateau is bounded on the east by a range of hills running back from and parallel with the Fraser River; on the west by the main hills of the Nazko Divide, rising to an elevation of approximately 7,000 feet; on the south by undulating hills which divide the headwaters of Baker Creek from the headwaters of Narcosli Creek. Three main tributaries run in a northerly direction through this plateau, and are locally called: South Creek, which is the main South Fork of Baker Creek, rising a few miles from the headwaters of Narcosli Creek; Middle Creek, which runs through the centre of the plateau and heads from a large lake marked on the maps as Tzenxaicut Lake; and Mountain Creek, which runs along the eastern edge of the plateau. This creek is not as large as either Middle or South Creek.

The valley of South Creek is in most places narrow. To the west pine-covered hills rise steeply and run back to the main Nazko Divide. To the east the hills rise less steeply to a low divide between South and Middle Creeks. In places the valley widens, leaving natural wild hay meadows through which runs the creek. Two quarter-sections were surveyed in this valley. Further work was made impossible by the high water which prevails in June. Ten miles below Tibble's pre-emption the South Fork turns to the west, running in this direction some 5 miles before again turning to the south. Running down South Creek is an old Indian trail, in many places very difficult to follow. This trail follows South Creek to its headwaters; then crosses a low divide to the headwaters of Narcosli Creek and runs on to Alexandria. Along the trail are numerous hay meadows which at present have not been taken up or surveyed. Altogether about 750 acres of open swamp-hay meadows were found along this trail. The best of these were on the headwaters of Narcosli Creek.

Middle Creek runs out of Tzenxaicut Lake and runs parallel with and about 2 miles to the east of South Creek, joining the South Fork of Baker Creek about 2 miles to the west of Puntataenkut Lake.

Tzenxaicut Lake lies at an elevation of approximately 2,850 feet and is some 8 miles long and 3 miles wide. Steep jack-pine covered hills rise from the lake-shore to an elevation of 400 feet, or 500 feet above the lake. From the east end of the lake a trail runs to Kersley and from the west end a trail follows down Middle Creek. There is no trail around the lake, but the Indians who use this lake extensively for putting up their winter supply of fish have canoes cached at either end. Middle Creek where it flows out of the lake is approximately 15 feet wide, 1 foot deep, and flows over a pebbly bottom at about 5 miles an hour.

The formation of the valley of Middle Creek is very similar to that of South Creek. The valley, generally speaking, is narrow and in places widens, leaving good hay meadows in the bottom. Of these, five were surveyed this season and there are still three meadows growing good hay which could be surveyed in the fall. During the past years the hay of several of these meadows has been cut by settlers living on Baker Creek.

About 3 miles to the east of Middle Creek runs Mountain Creek, which drains the eastern side of the plateau and runs into Baker Creek about 4 miles east of Puntataenkut Lake. Along this creek and on some of its smaller tributaries are good hay meadows, the best of which were surveyed this season. In all, approximately 2,600 acres of good swamp-hay meadow were found around the headwaters of Baker Creek, or which 1,634 acres were surveyed. The remainder should be surveyed in the fall of the year, when the waters are low.

The plateau is served by a good wagon-road which runs from Cooper's pre-emption (Lot 9512) south along Middle Creek for a distance of about 8 miles, when it crosses Middle Creek and runs to Townsend Lake. Trails radiate from here to the various hay meadows in the locality.

The headwaters of Baker Creek form essentially a small cattle country, growing plenty of hay to winter some 2,000 head of cattle; its chief drawback is lack of a good spring range. There are several settlers in this part of the country; two of these, Quandstrom and Tibble, are married and have large families. At present there are not sufficient children to have a school in the district, but it is expected that a school will be started next year, which will be attended by some of the children from the Nazko Valley. Supplies for this part of the country are easily obtained from Quesnel over a second-class Government road.

The settlers, besides raising cattle and horses, have gone in to a certain extent for small mixed farming. Quandstrom has cleared a few acres of jack-pine land and now grows good potatoes and vegetables, besides keeping chickens and cows for domestic purposes.

Game of all kind is very plentiful. Several moose, deer, and black bear were seen, while fresh tracks of all kinds were seen daily. Trout and whitefish are plentiful in South and Middle Creeks, but will not take a fly in June, when the water is high.

Baezaeko Valley.

On completing my work around Baker Creek I moved to the Nazko, and then on to the Baezaeko Valley, where I surveyed a pre-emption belonging to A. McKenzie. Around the junction of the Coglistico and Baezaeko are several good hay meadows which at present are occupied by Nazko Indians, who have erected some miles of fencing and have put up log cabins. Any white man attempting to take up these lands would receive considerable hostile treatment from the present Indian squatters.

The Baezaeko at its junction with the Coglistico is about 150 feet wide, and in July had an average depth of 2½ feet. The river flows at about 6 miles an hour over a hard pebble bottom. From the junction of the Coglistico down, the Baezaeko runs for about 10 miles through a barren valley which is useless for any sort of agriculture. Some 4 miles before the Baezaeko enters the Blackwater the valley widens, leaving some large tracts of level land on either side of the river. Some of this has been used by Joe Spiers, a settler lower down the Blackwater. He has erected fences and has built a wagon-road from the Nazko to a cabin he has erected on the Baezaeko. He is waiting for the land to be surveyed to make application for a pre-emption record. Two good quarter-sections could be surveyed here. The soil is a rich brown loam, at present growing peavine and wild timothy. Spiers has cut hay here for the last few years for winter feed for his stock.

The Baezaeko River above the Coglistico runs through a flat about 2 miles long by half a mile wide, the greater portion of which is held under Indian Lease No. 175. Above this the river runs through a barren country and no land fit for agriculture was found.

COGLISTICO VALLEY.

A tie-line was run from the Baezaeko Valley, following the Kluskus Sleigh-road up the Coglistico Valley to the 124th meridian, some 10 miles distant. The valley throughout this distance is narrow; the sides slope up steeply and are heavily covered with small jack-pine. No horse-feed was found between the Baezaeko Valley and a small meadow lying at the 124th meridian, and this piece of country is valueless for agriculture.

RED RIVER VALLEY.

From the junction of the Baezaeko and the Coglistico a trail runs to Lot 6715 (McKenzie's pre-emption). It follows through the meadow on this pre-emption; then crosses a low divide to Red River Lake, about half a mile away. This lake is about 1½ miles long by three-quarters of a mile wide and is extensively used by the Indians for fishing. Running out of the east end is Red Creek, which flows into the Nazko. A good trail follows down the creek and about half a mile from the lake passes through a good natural hay meadow which has not been surveyed. A good quarter-section could be put in here. Some 3 miles farther down the creek passes through more open land, where another good quarter-section could be surveyed. The valley here is wide and to the north the side-hills are open and grow good feed, chiefly wormwood. Cattle from the Nazko come up into this valley for the spring feed.

A 3-foot seam of soft bituminous coal crops out on the side-hill here and is used by the settlers for blacksmith-work and heating. There is also a small outcrop of iron ore, which stains most of the country and covers the water of Red Creek a ruddy brown.

NAZKO VALLEY.

On completion of my work in the Baezaeko country my party moved back to the Nazko and surveyed 1,620 acres of hay and grazing lands into quarter-sections. The Nazko Valley, in which these surveys were made, was described in detail in my report of last year (*see* Annual Report Minister of Lands, 1919). From Lot 6718 a tie-line was run to a meadow taken up by Mrs. Wentworth some 5 miles to the east of the Nazko Valley. An old wagon-road was found leading to this pre-emption. It was much blocked by deadfall and took us two days to cut out. This pre-emption was surveyed as Lot 6720. The country to the east was explored as far as the Nazko-Baker Creek Divide and several open tracts were seen from the hills. These on closer examination all proved to be large muskegs and of no use for agriculture. It would be an easy matter to construct a wagon-road from Mrs. Wentworth's pre-emption through to the headwaters of Baker Creek, thus linking up the hay meadows of the headwaters of Baker Creek District with the good spring and summer grazing lands of the Nazko Valley.

The country between Mrs. Wentworth's pre-emption and the hills of the Baker Creek Divide is undulating and is covered with small jack-pine, through which are scattered many large open swamps and muskegs. This area is quite valueless, as the soil has been burned away by numerous bush fires, leaving a rocky surface with practically no soil.

On completion of the survey of Lot 6720 my party returned to the Nazko Valley. A new wagon-road has been cut up the valley to Lot 6720, and I continued this road some 6 miles to the foot of a lake known locally as Nazko Lake. This is not the same Nazko Lake as is shown on the maps, the latter being at the headwaters of the Nazko River. From the end of the wagon-road we built a raft and moved to the top end of the lake, where we completed our surveys in the valley. In places this lake is very shallow, with a hard bottom, and good progress was made by hitching our team of horses to the raft and towing it up the lake.

NAZKO–CHILCOTIN ROAD.

At the end of August we left the Nazko and proceeded some 100 miles to Chezacut. An old wagon-road follows the Clisbako River for some miles and then continues on to the Chilcotin. The first 40 miles of this road had not been used by a wagon for six years and took us two days to cut out. The road makes no attempt to follow any particular grade and was originally located up and down hills, where was the least amount of chopping. Four horses were just able to pull a load of about 1,400 lb. over this road.

At Lot 3431 another wagon-road branches to the east and runs down to Christie's Pre-emption (Lot 3435). The Christie Bros. have cut out a road from here in a north-easterly direction for about 10 miles to a large hay meadow, where they have erected a log house and have put in numerous improvements. This meadow is approximately 4 miles from the Nazko Valley. The Christies are waiting for this piece to be surveyed in order to take it up. Along the 10 miles of wagon-road that they have built are several smaller hay meadows; in all, approximately 600 acres well worth surveying. The country as a whole is valueless, excepting for the hay meadows which are scattered between the low-lying jack-pine covered ridges.

On leaving the Christie's place (Lot 3435) the Chilcotin Road crosses a flat for about a mile and then commences to climb the hills of the Nazko-Chilcotin Divide. The road winds through a natural pass and at no place is the grade excessive. Four miles from the commencement of the climb the summit is reached at an elevation of approximately 5,000 feet. Beyond the summit the road falls steeply, and at a distance of about 3 miles passes through some good hay meadows which have been surveyed as Lot 4756. Here a wagon-road forks; one branch to the left passes by Loomis and Goring's pre-emption (Lot 4799) and continues to Alexis Creek; the other forks to the right and runs to Chezacut. This road passes through some miles of open flat hay land which has all been taken up and on which settlers put up many tons of hay each year. Four days were spent in the Chezacut country running tie-lines between existing surveys.

Puntzi Lake Country.

On completion of this work I moved to Puntzi Lake, where I commenced running a tie-line east, connecting previous surveys. A valley runs from Puntzi Lake in a north-easterly direction for a distance of about 10 miles to a large plateau which runs back to the foot-hills of the Atchi Mountains. This plateau is fairly level. Low jack-pine covered ridges divide the numerous creeks which flow from the foot-hills and eventually drain into the Chilcotin River. Along many of these creeks are good hay meadows, all of which are cut each year by the Redstone Indians, who have done much work in this part of the country and rather consider it as their own. The majority of the meadows have been fenced and cabins erected by the Indians. The plateau, which lies at an elevation of approximately 3,500 feet above sea-level, is valueless, excepting for its hay meadows. The only timber seen was small 3- to 4-inch jack-pine and a small quantity of 9- to 12-inch bull-pine.

This country is honeycombed with good Indian-built wagon-roads. All the meadows are connected and roads have been built down the creeks to Chezacut and Puntzi Lakes. Another good wagon-road connects Chezacut and Puntzi Lakes and runs to the main road near the Redstone Indian Reserve. Outside the Indians there is only one settler in this country, a German, who lives on Lot 261.

Many cattle were seen grazing on the open flats, chiefly Indian, with a few owned by white people. The difficulty of cattle-raising here appears to be that the country is so large that it is very difficult to round up the beef when they are required. While I was in this country several Indians were met who had been hunting their cattle and horses for some days without success.

No game were seen on this plateau, chiefly owing to the number of Indians who shoot both in and out of season.

On completing my work I proceeded to Alexis Creek, where my work for the season terminated.

I have, etc.,

W. C. Merston, B.C.L.S.

SOUTH-WEST OF BIG CREEK, LILLOOET DISTRICT.

BY G. R. BAGSHAWE.

WILLIAMS LAKE, B.C., January 7th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit report on surveys made in the early summer to the south and west of Big Creek, Chilcotin.

Our first work was the tying-in of some meadows surveyed by myself the previous fall and known as "Tretheway's Meadows." They are situated on Tete Angola Creek, a tributary of the Whitewater (Taseko River). One of the claims is occupied by Louis Vedun as a pre-emption. Our instructions were to connect this survey to Lot 3233, Lillooet, the most westerly survey of the Big Creek system. It was also desired to run the tie-line along a road connecting these meadows with John Robinson's ranch, Big Creek, the most outlying farm in the settlement.

A road has been built by Robinson to Lot 3233, on which his wife had pre-empted some years ago, and in the summer of 1919 Vedon cut a road from his pre-emption to join Robinson's road about 6 miles out from the latter's ranch. Leaving Robinson's house, the road runs through oat-fields for a mile, and then climbs through the timber to descend later in a long steep hill to the West Fork of Big Creek. locally known as Robinson Creek, which it follows. About 6 miles from the ranch the creek forks, the South Fork coming from Lot 3233, due south, whilst the north valley continues south-west. Vedon's road commences here and follows the latter valley to a cabin 3 miles farther on, where our traverse-line struck it. Robinson's road swings south and the party followed it to camp, about a mile below Mrs. Robinson's pre-emption.

We commenced our tie from the north-east corner and ran a line north-westerly to hit Vedon's road as soon as possible. The north-west corner would have been nearer, but we were informed that the running was bad and the country unsuitable for pack-horses. We afterwards found this to be incorrect. Our line hit Vedon's road close to the cabin above mentioned, known as Halfway Cabin.

A narrow meadow runs along the bottom of the valley and here the road crosses from the north to the south side. There is also a blind trail blazed on the north side, but this should be avoided.

Striking through the timber for a mile, the main road debouches on the edge of a second long meadow, along the north side of which it follows for 1½ miles to enter the timber again at the foot of a long hill. Two miles farther the summit is reached. The mountain-top a little to the right gives an extensive view of the surrounding country. Down below to the left of the road is Fish Lake, about three-quarters of a mile long.

For 3 miles the road descends till it reaches a large flat, skirting the south side of a chain of meadows to Vedon's homestead. The largest of these meadows is about 1½ miles square, with smaller ones at the south-west and easterly ends. There is about 2,000 acres of open land altogether. Vedon's claim at the south-west contains some fine hay land lying on Tete Angola Creek. The large central portion is mostly peat-swamp, with patches of good land. A lake at the east end has some good meadow on its shore which would be suitable for settlement.

On the swamp the grass grows in bunches, or "nigger-heads," which rise above the snow and make good winter feed for stock. There is a lake at the north edge of the large central swamp and a smaller one half a mile south-east.

Fish Lake drains into them and they in turn drain into Tete Angola Creek. The latter winds a slow course along the western edge of the meadows.

The land here is probably 4,000 feet elevation, but we had no reliable means of estimating it. To the north-west the land falls away to the Whitewater River and is timbered with pine and poplar, with large open spaces. It is purely a stock country, being too high for grain to ripen. Vedon has a small vegetable-garden. Potatoes were a failure last year.

Tete Angola Creek is full of trout and Indians come in the fall to catch and smoke them. With a basket trap 70 lb. were taken out in one night.

COPPER CREEK.

A claim was surveyed here for A. Piltz, who is located on a large meadow, with a lake to the north end. The ranch is about 20 miles south of Big Creek Post-office, from which there is

a good wagon-road. The farm is well planned with corral and good buildings and a considerable amount of ditching and fencing has been done.

From here we ran a traverse to some meadows 7 miles to the south-west. A rough wagon-road gives access to them, crossing Big Creek 4 miles from Piltz's ranch. These are small hay meadows which were surveyed into 40-acre lots.

Four miles down Cooper Creek from Piltz's ranch is a chain of three small meadows of 15 to 20 acres each, which we also laid off in 40-acre lots.

The valley of Cooper Creek runs through a rough mountainous country, the lower lands being rolling and timbered with jack-pine and occasionally poplar. In the valley itself are a few meadows, all of which are now surveyed. Above Piltz's ranch, where our traverse crossed it, Big Creek cuts a deep valley, almost a canyon, and has a heavy fall.

The district is of high altitude and is essentially a stock country.

I have, etc.,

G. R. Bagshawe, B.C.L.S.

VICINITY OF HORSEFLY AND WILLIAMS LAKE, CARIBOO.

By G. R. Bagshawe.

Williams Lake, B.C., January 5th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit report on surveys made by me in the vicinity of Horsefly and Williams Lake, Cariboo District.

The work consisted in the survey of land held under old pre-emption records and also of parcels upon which intending settlers wished to file. The operations in the Horsefly were carried on in August and September, from Harpers Camp as base. The weather was very unsettled.

Moffat Creek.

The first survey was made for L. Walters on Moffat Creek, about 13 miles south from Harpers Camp, or 19 miles following the road. The land here is high and rolling, covered with jack-pine and poplar, interspersed with peat-swamps and occasional hay meadows. The best way in is by the road to 108-Mile House. About a mile above McIntosh Lake a road leads off to the east, past Mikelson's ranch, for about 5 miles; from the end of this wagon-road a trapper's trail leads to Walter's pre-emption 2 miles farther in. At the north-east corner of this claim is a small lake out of which flows Moffat Creek. There is a small stand of pine and spruce south of this lake, but we did not examine its extent.

Bells Lake and Skunk Creek.

Travelling the 150-Mile House Road from Harpers Camp for 5 miles, a wagon-road leads off to the left to Bells Lake, about a mile distant. There are three ranches round the lake, located in good hay meadows. One of these we surveyed. Farther back are several small meadows of varying size. Whilst staying here we were requested to survey a lot on Skunk Creek for a prospective settler.

Skunk Creek parallels the Horsefly Road on the north side in a deep valley, in the bottom of which is a strip of meadow 3 to 4 chains wide. Across the valley is a rolling country timbered with poplar and jack-pine. Half a mile below our survey Skunk Creek joins Gravel Creek in an open meadow upon which hay was being cut. I am informed that in this valley the snow melts considerably earlier than in the surrounding country.

Upper Horsefly River.

It being necessary to go up the Horsefly River to amend a survey on Woodjam Creek, we were requested to survey three parcels for intending pre-emptors. The river at Harpers Camp is some 200 feet wide. Following up-stream for the first 2 miles, it runs through a wide valley with meadows on each side, in a horse-shoe bend, concave to north.

This land has long been settled and farmed. Continuing up-stream, the river bends to the right, thus making a complete letter S, and the valley narrows down, with high benches along the sides, till Sucker Creek is reached, some 3 miles farther. For the next 3 miles the river

flows with a heavy fall through a deep canyon. Above the canyon the valley opens out again to a width of quarter to half a mile and continues thus for 8 miles, as far as the party went.

Woodjam Creek enters the main river from the south a mile above the canyon, forming a large meadow flat at the junction. The bed of the main valley is almost level and forms one long meadow about 30 chains wide, through which the river flows at 3 miles an hour (September). The soil is a deep fine silt, in which the stream has cut a channel some 8 feet deep and 100 feet wide. The course of the river takes many turns, making a traverse 40 per cent. longer than a direct line. Of this more later. There are also numerous horse-shoe sloughs leading from and back to the river, showing the position of old channels. At the time of survey the river was about 5 feet deep and fords at intervals. There are several ranchers in the valley, Mr. McKenzie, of the Woodjam, owning the largest. The main crop on the bottom lands is hay, the soil being too cold to grow grain successfully on account of floods. On the benches above, however, can be grown excellent oats and garden produce. Albert Patenaude, 6 miles above Woodjam, has a fine garden, in which we saw potatoes up to 3½ lb. weight.

Irrigation is not necessary, but may be employed to advantage in dry seasons. The greatest drawback to the whole valley is the backing-up of the river at high water, and of still more concern is the slowness with which it escapes again. Our attention was called to this several times, and the ranchers are most anxious that an examination be made to see if it cannot be remedied by cutting a deeper channel at the top of the canyon.

From my own observation there appeared to be two matters for consideration: First, the trouble in the upper reaches seems to be that the water cannot drain away fast enough owing to the very slight fall of the river, which, judging by the flow, is some 2 to 3 feet per mile along its course. This, owing to the many turns, would give a fall of 4 feet if the river were straightened. In one place it travels three-quarters of a mile around a bend, the ends of which are only a quarter of a mile apart. If a straight ditch were cut through the soft silt the water would soon wash a new channel with three times the fall of the old one. By an extensive use of this method a great improvement could be made in all but the lower part of the valley, some 3 miles above the canyon or 2 above the Woodjam Ranch, which would be in a worse position than at present. To allow the water to escape it would be necessary to open a deeper and wider channel at the top of the canyon.

The valley appears to have been at one time the bed of a lake, dammed up by a slide of rock through which the river has now cut to form a gorge. This slide forms a wall of rock over which the river flows as over a dam, the bed below falling away on a grade of about 0.6 per cent. For three-quarters of a mile above the water is almost stagnant, some 7 feet deep on a silt bottom. At the request of the settlers I took, on my way back to Harpers Camp, levels for a distance of 200 feet above and 500 feet below the top of the canyon, with a view to seeing the feasibility of cutting a deeper channel. A profile and cross-section will be forwarded as soon as prepared.

I consider this one of the finest stretches of meadow land in the district and one which would well repay expense in improving. The valley is about 2,400 feet elevation.

WOODJAM CREEK.

Woodjam Creek drains into the Horsefly about 9 miles above Harpers Camp by river or 7½ by road. There are some good open flats along the lower mile or two, some of which have been ploughed and cropped with grain. The valley becomes narrower farther up, but there is still some fair bottom land vacant. Three miles above the mouth a pre-emption was surveyed by J. B. Patenaude. Above this the creek runs through a rough timbered country.

NORTH SIDE OF HORSEFLY RIVER.

There is a stretch of good land on the north side of the Horsefly Valley, drained by the Sucker and Marten Creeks. Some of this is surveyed, but there is still a large unsurveyed area suitable for settlement, containing a number of hay meadows. One of these was surveyed by T. R. Greer. I understand that there are other locations equally good.

ROADS.

There is a newly constructed road from Harpers Camp to a mile above Woodjam. This is not shown on the map, but follows the Marten Creek Road for 3½ miles before striking off to the right along the high benches north of the river, to which it descends opposite Woodjam. A

ferry at this point, under construction last September, should now be completed, giving access to Woodjam Creek. The main road follows the side-hill north of the river and a mile farther up the completed road ends. A wagon-road built by settlers continues up the valley.

TOWNS, SCHOOLS, AND POST-OFFICES.

Harpers Camp is the nearest town and consumes all the produce raised. It has a settled population of about 100, besides being the headquarters for the district. The school, postal and telegraph office are located here. A stage runs weekly with mail to Williams Lake, on the Pacific Great Eastern, 46 miles distant by way of 150-Mile House.

CLIMATE.

The Horsefly country has a greater rainfall than that farther west and irrigation is not necessary. There is a somewhat heavy snowfall which remains late in spring. The moist climate makes a thick vegetation and the heavy growth of grass and peavine give excellent summer range for stock. The heavy snowfall makes winter feeding necessary.

The Horsefly and Beaver Valleys are well adapted for dairying and mixed farming, but the high land to the south is essentially a stock country.

GAME.

Bear-tracks were seen continually, but few deer. On several occasions the lines ran through new beaver-workings, the beaver being plentiful along all the creek flats. Harpers Camp is a big trapping centre, the furs being mostly mink, marten, red fox, and coyote.

WILLIAMS LAKE.

In October the party moved to Williams Lake and surveyed three pre-emptions some 7 miles to the north on the old Soda Creek Road. These consisted of hay meadows about 2,700 feet elevation.

FRASER VALLEY.

A pre-emption was surveyed for M. Duffly between the mouths of Williams Lake Creek and Chimney Creek. It contains some good bench land and a spring, but is difficult of access, the best route being via a trail along the river from Isnard's ranch at Chimney Creek. I am informed that there is a trail direct over the mountain from Williams Lake, but it is very rough, descending some 1,000 feet down to the Fraser.

MELDRUM CREEK.

A survey was made for E. B. Stowell a mile south of Meldrum Creek, in a poplar and jack-pine country, with occasional small meadows. A wagon-road is under construction along the river-side from near the mouth of Meldrum Creek to the Chimney Creek Suspension Bridge. At present about 4 miles are completed.

I have, etc.,
G. R. BAGSHAWE, B.C.L.S.

VICINITIES OF BRADLEY CREEK, BRIDGE CREEK, AND TIMOTHY MOUNTAIN, NORTH-EAST LILLOOET DISTRICT.

BY W. S. DREWRY.

VICTORIA, B.C., January 7th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—In conformity with your instructions dated May 26th, 1920, a party was organized and we proceeded to Bradley Creek Valley, in North-eastern Lillooet District, by way of the Cariboo and Canim Lake Roads. At about Mile 18 from 100-Mile House a road branches from Canim Lake Road and leads northerly 2¼ miles to Ruth Lake. From this point the road has been continued about a mile, again reaching an arm of Ruth Lake, from which point a trail leads north about 2 miles to Bradley Creek, into which Ruth Lake discharges at the trail crossing through a small creek about a mile long.

Bradley Creek is in the gutter of a great trough which extends from near the west end of Murphy (Eagle) Lake, southerly and easterly to the valley of Murphy Creek, about a mile above its debouchment into Canim Lake, some 7 miles from its easterly end.

The whole trough is, however, not occupied by Bradley Creek, which has its sources on the north and east slopes of Little Timothy Mountain, and enters the trough about 13 miles from Murphy Creek, flowing into a shallow pond formed by a beaver-dam. A creek also comes into this pond along the trough, but is small and only some three-quarters of a mile long. At the head of this stream there is a flat divide, north of which the water apparently runs to Murphy Lake.

From the beaver-pond mentioned above Bradley Creek flows south about a mile and forms Bedingfield Lake, about a mile long and half a mile wide, occupying the whole width of the valley. Thence the stream flows southerly and easterly about 9 miles to Hawkins Lake, which in turn discharges into Murphy Creek through a channel somewhat less than a mile long.

Above Hawkins Lake for about 2 miles the valley is about a quarter of a mile wide, beyond which it broadens, attaining half a mile in width in places.

There is considerable first-class black loam bottom land, partly in willow swales and meadow, with open poplar and pine flats adjoining. The hill-slopes on either side rise quite sharply from the valley in some parts; but at many points the slopes are easy, all being generally covered with a luxuriant growth of grasses and plants, including bunch-grass, peavine, and lupine, among the scattered firs which usually grow on the ridges.

Taken as a whole, it is considered that this valley is eminently suitable to dairying and grazing; while its altitude of about 2,700 feet above sea permits the growing of grains and garden vegetables, such as potatoes, peas, beets, carrots, turnips, lettuce, radishes, etc., which are successfully grown on Lots 3920 and 4993, the former at the east end of Hawkins Lake and the latter about 5 miles above.

If the wagon-road constructed to Ruth Lake is extended about 2 miles to Bradley Creek, there is little doubt that most of these bottom lands would be settled in a very short time, as during the period of survey several prospective settlers looked over the country and expressed themselves as satisfied with its character, but complained of present difficulty of access by trail. From Lot 4993, where the proposed wagon-road would reach the creek, a sleigh-road passable for wagons has been cut by settlers for a distance of more than 5 miles up the valley.

The water of Bradley Creek is very good, and several small spring creeks flow in on either side, the sources of which are probably small lakes lying in higher-side-valleys.

At Hawkins Lake the timber and brush is quite dense, and this condition obtains for about 2 miles, from which point it becomes quite open, consisting largely of small poplar and some pine, with willows along the creek. In places there are groves of pine growing tall and straight, free from limbs for from 20 to 40 feet, affording excellent building-logs.

The ridges are clad with pine and large scattered fir, considerable of which is balsam fir; but the timber generally is open, and there is luxuriant grazing throughout.

About the west end of Hawkins Lake there is a fine stand of clean-growing balsam fir which would make good saw-timber, while about a mile up the valley on the south side of the creek there is an area of large spruce.

The natural conditions for successful settlement apparently exist, but continuation of Ruth Lake Road is essential to secure their immediate use by settlers.

Owing to narrowness of the valley and its direction, it was found necessary to survey it in 160-acre lots to avoid including too much land suitable for pasture only. This entailed an extra amount of line-running; but it is thought that the result justified it, as every lot surveyed is believed to be suitable to settlement.

Work was somewhat delayed by the extreme rainfall in September, during which month we had nineteen days in which it rained all day or in frequent heavy showers, some of them accompanied by violent electrical manifestations.

While in the vicinity Ruth and Hawkins Lakes were surveyed, partly by traverse and partly by triangulation where no agricultural land lay along the shores. Ruth Lake was found to be larger and of quite different shape to that shown on existing maps. It lies north of Lot 4992 and has deep bays or arms included within an area of 3 miles north and south by 2 miles broad. It is a very beautiful lake, particularly in autumn, with clear sweet water and in part bold shores, making many charming bits of scenery.

Hawkins Lake is slightly over 2 miles long, with an extreme width of half a mile, and lies in an east-and-west direction. The hills rise steeply from part of the shore-line and are of no value for cultivation; but along the north shore excellent pasturage is found on the tops, consisting of bunch-grass and peavine. Rainbow trout of fair size are fairly plentiful and rise well to a fly, except when the water is glassy.

Lands Adjacent to Bridge Creek Valley.

The Forest Grove Farmers' Institute having reported considerable land fit for settlement in the vicinity of Lot 4203, a short distance north of Canim Lake Road at Indian Reserve No. 2, an exploration was made, resulting in the later survey of 1,280 acres of land; Lot 4207 containing 640 acres lying north of Lot 4203, and Lot 4204, of the same area, east of it. The land lying north and east is mostly rough with high fir-clad ridges and unsuited to settlement.

The easterly portion of Lot 4207 is occupied in part by a lake which discharges into another lake wholly within Lot 4204, about both of which there is considerable meadow. The stream flowing from the lower lake crosses Canim Lake Road on Indian Reserve No. 2, where it has been used for irrigation purposes. Possibly, if these lakes were improved as reservoirs, the beneficial use of water for irrigation and other purposes could be extended to other lands in Bridge Creek Valley, the lakes being, I believe, spring-fed.

The lots surveyed are traversed by a fairly good road leading north-westerly from near 13-Mile post on Canim Lake Road to what are known as the "Indian Meadows" on Lots 4208 and 4209. It appears that this road was constructed by Indians, who also built cabins at the meadows, on which they made hay. They, however, lost possession after survey of the lands, which are now, I believe, held under lease.

The uplands on Lots 4207 and 4204 rise very gradually from the lakes, and for the greater part are timbered with quite open poplar and some pine. There are numerous willow and alder thickets, but generally the clearing would be light. The northerly portion of Lot 4207 is rough in part, the balance of the land being gently rolling, with black loam soil and clay subsoil. That part of Lot 4204 lying along the road west of the lake is similar in character to Lot 4207; but the north-east quarter of the lot is somewhat rough and better adapted to grazing. The vegetation throughout both lots is luxuriant and affords fine pasturage, especially on the poplar-flats. While these lands are considerably higher than Bridge Creek Valley, it seemed that frost effects in October were less noticeable than on the lower lands. The location and conditions seem quite suitable to dairying and grazing, as good fodder crops could be grown.

Exploration about Timothy Mountain Lake.

During the summer an exploration of the country about Timothy Mountain Lake was undertaken with the purpose of ascertaining approximately the extent of arable land in that section. Fine poplar-flats were found to extend along the north shore of the lake, but on the south side the ground is rough, rising sharply to a fir ridge which extends some 3 miles in an east-and-west direction. The ridge, however, is narrow, and south of it for about 3 miles is a fine country, much of which is open poplar-flats with some pine. Only two meadows of consequence were observed; but it is quite possible that there are others which escaped notice owing to the necessarily hurried nature of the exploration.

This tract may be reached by road either from Lac la Hache or 111-Mile House on the Cariboo Road. A hay-road has been made from the west end of Timothy Mountain Lake some 2 miles south, and if this were continued east about 3 miles through flat, easy country to Lot 4989 at the south end of Dempsey Lake, connection could be made to a road about 1½ miles long leading down to the wagon-road in the valley of 111-Mile Creek near Chub Lake. In this way the whole tract might be rendered easily accessible to prospective settlers, it being only about 8 miles east of the Pacific Great Eastern Railway at Lac la Hache, from which point there is a passable road.

The soil is black loam with clay subsoil, mostly free from stone. On Lot 1151 at the end of Chub Lake an excellent garden was visited, showing that the agricultural possibilities are good. The area seems well worthy of attention for settlement purposes.

Closing Operations.

Having completed work in the vicinity of Indian Meadows, the party moved to 100-Mile House, where a lot of 160 acres was surveyed south of Lot 2139 for pre-emption purposes.

A camp was made at 93-Mile Creek and a lot of 160 acres lying about a mile to the west along the creek was surveyed. The land in the vicinity outside the meadows is generally worthless for cultivation, being very stony. There are, however, a number of meadows which it would probably be advisable to survey, as some are of good size. Meadows in this section of country are in demand; but absence of definition by survey militates against occupation, which would mean revenue from lands now unproductive.

By this time, the end of October, the weather was commencing to break with flurries of snow, so no further survey operations were attempted. The horses and outfit were placed for the winter near 100-Mile House and the party taken to Ashcroft by motor and paid off.

GAME AND FISH.

There seemed to be considerable game in Bradley Creek Valley, especially near Hawkins Lake. Deer were plentiful, sometimes coming among the horses grazing near camp. Black bear were numerous throughout the valley, especially about Hawkins Lake, where they fed regularly in a raspberry-patch near camp. On Upper Bradley Creek, and south of it, moose-tracks were observed at various points. Tracks were also seen on Lot 4207 near Indian Meadows. Coyotes appeared to be few in number, probably owing to scarcity of rabbits, on which they feed. Muskrats seemed to be quite plentiful along Bradley Creek, some being killed among our food-stores, which they damaged considerably. Beaver were present in the creek, as fresh cutting was frequently noted. Willow-grouse were fairly numerous in all parts visited. Sharp-tailed grouse were first noted at Indian Meadows. These birds are commonly known as prairie-chickens, and several bands of from fifty to a hundred or more each were encountered in Bridge Creek Valley. At 93-Mile Creek and along the Cariboo Road as far down as 70-Mile House numbers of these birds were seen, appearing to be more plentiful than were before noted.

Very few wild ducks or geese were observed in the country operated in. They were also reported as being scarce about 70-Mile House, where usually abundant.

Hawkins Lake and Bradley Creek contain rainbow trout, as also does Ruth Lake, in which latter water they are apparently not numerous, but of large size and difficult to catch. Bridge Creek affords fine sport in some localities, the fish being up to about 1 lb. in weight.

I have, etc.,

W. S. DREWRY, B.C.L.S.

SOUTHERN LILLOOET DISTRICT.

BY G. M. DOWNTON.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—Acting under your instructions, I organized a survey party in Lillooet on June 7th with a view to commencing the season's programme in the Southern Lillooet District.

The work this season consisted of the survey of certain pre-emption records still remaining unsurveyed, which were staked before the amendment to the "Land Act," and also the survey of Crown land suitable for settlement should such be found in the immediate vicinity of my operations.

The above-mentioned pre-emption records were widely scattered over a very large area, and this fact, combined with the difficulty of transportation, rendered it impossible to carry out the entire programme mapped out at the commencement of the season. It was originally hoped that the pre-emption records in the Pemberton section and in the area immediately adjacent to the town of Lillooet would be handled, but as the season progressed it was found that these areas could not be included in this year's programme. The work actually carried out was therefore confined to four distinct areas—viz., the Bonaparte Plateau, the Bridge Lake area, the Bonaparte River Valley, and the Bridge River Valley.

I left Lillooet on June 8th with my party with a view to commencing operations on the Bonaparte Plateau and in the adjacent country, and arrived the same day by the Pacific Great Eastern Railway at the 70-Mile House on the Cariboo Road. The next day I moved in to a point about 9 miles due east of the 70-Mile House and commenced operations.

The Bonaparte Plateau.

This area consists of a fairly level plateau, situated at an elevation of about 3,700 feet above sea-level. It is covered for the most part with a fairly dense growth of lodge-pole pine (*Pinus contorta*) averaging about 6 to 10 inches in diameter, while on the numerous small ridges and elevated points of the plateau there is a stunted growth of Douglas fir (*Pseudotsuga mucronata*). Owing to the dryness of the climate, the annual rainfall not exceeding about 15 inches, the Douglas fir presents a very different appearance to the same species in the Coast region. The growth is infinitely slower, and the trees, being scattered, have a chance to develop their lower limbs. The result is a comparatively short, thick, gnarled, and knotty growth of no commercial value and of little use for anything except fuel.

In addition to the above-mentioned timber, there is a fairly general growth of cottonwood in the damper spots, which even in the most favoured localities seldom reaches a larger size than about 6 inches in diameter on the stump, and when it attains this size appears to fall a victim to a disease which rapidly destroys it. Long-leafed and black willow complete the general forest-growth, and these grow for the most part along the edges of the shallow lakes with which the country is dotted.

These lakes derive their supply of water from the winter snowfall, the depth of which averages about 2 feet 6 inches throughout the winter, and on account of the uniform level of the plateau are mostly rather stagnant and in many cases quite strongly alkaline. The surplus water from these lakes in the spring gradually flows away along some definite watercourse, and in this way irrigates the depressions and even forms temporary lakes along its course. During the summer these dry up and produce fairly large crops of swamp-hay.

It is on the hay which these swampy meadows produce that the settlers in this area depend for the feeding of their stock over the long winter. It may be said that on an average one-half to three-quarters of a ton per acre is all that these meadows will yield, and intending settlers should realize, therefore, that the area is, first of all, only suited for stock-raising, and, secondly, that the supply of winter feed is very limited. The cattle have regular runs along these meadows and the settlers at present pursue the rather precarious method of cutting the meadows which are not on these runs to supply their winter needs.

The soil over the whole of this area, with the exception of that in the above-mentioned meadows, is a light sandy loam. This lies in a subsoil of glacial drift and boulder-clay of an unknown depth. The higher portions are very unproductive, and with the exception of a sparse growth of peavine and willow-herb there is practically no vegetation to support animal life. A uniform covering of pine-grass grows all through the timbered parts, but this is so bitter that stock will not touch it.

A great many of the higher ridges are very rocky, and it would appear as if these had been worn bare by the same glacial action which deposited the gravel in the lower parts. This area may be said to extend right from the Marble Mountains on the west to Young Lake and Eagan Lake on the east, but it is only with that portion lying east of the Cariboo Road that this report deals.

The Bonaparte River and its tributary streams flow in narrow valleys, considerably below the general level of the plateau described above, and the actual river-bottom lands come under rather a different category. A certain amount of such valley land is, or could be, brought under cultivation by irrigation and good crops of hay raised.

The first month of the season (June 8th to July 8th) was spent on the plateau above described, but on July 9th I moved eastward to the watershed of Bridge Creek by a road which, branching from the Cariboo Road at the 70-Mile House, traverses the country south of Green Lake and drops into the valley of the North Bonaparte at about 16 miles from the 70-Mile House. After following this valley for 5 miles the road climbs the slope on the east side, and gradually rising for 8 miles reaches a point on the highest part of the jack-pine plateau at about 4,600 feet above sea-level, from which an extended view to the north and east can be obtained. This point is about 30 miles from the 70-Mile House. At this point we were on the north-eastern extremity of the extensive plateau between the North and South Forks of the Bonaparte River, and, as it were, on the rim of a remarkable basin which is bounded on the east by the foot-hills of the mountain range lying along the west side of the North Thompson River. This basin stretches far to the north towards Canim Lake. The view obtained here is, however, deceptive, as it fails to reveal the numerous lakes which lie in the basin above described.

Descending from the plateau the road crosses a fairly level stretch of jack-pine country dotted with swampy meadows, some of which yield large crops of hay, and crossing another stretch of rather rough, stony country, reaches Crystal Lake at the 34-Mile post.

BRIDGE LAKE AREA.

At Crystal Lake the appearance of the country undergoes a marked change. The interminable stretches of lodge-pole pine are left behind and cottonwood and spruce take their place, while the luxuriant vegetation is most striking. Douglas fir still crowns the higher ridges, which become rocky and abrupt. There is every indication here of a very much increased rainfall, and the soil, which on the plateau farther west is sandy and unproductive, changes to a black loam. Here are wild flowers of infinite variety and pasture knee-deep on the hillsides. Pea-vine, vetch, and lupine grow in abundance, the latter giving the whole country a blue sheen which contrasts vividly with the white trunks of the cottonwood.

The watershed in this area is most complicated and unexpected. Numerous lakes lying within an area of a few square miles supply four distinct streams, all flowing in different directions. Thus, Crystal and Emerald Lakes discharge into the North Bonaparte, which flows first north-west and then south-west to the main Bonaparte River. Bridge Lake (or Great Fish Lake) is practically the source of Bridge Creek, which flows north-west to Canim Lake, and thence to Mahood Lake and the Clearwater River. Numerous smaller lakes, notably Crooked Lake, Whitley Lake, and West Twin Lake, drain into Bridge Lake about mentioned, but East Twin Lake, separated from its western twin by only a hundred yards, discharges south to Eagan Lake and the South Bonaparte River. Muddy Lake and Lac des Roches are drained by Nekalliston Creek direct into the North Thompson River. I arrived at Bridge Lake on July 10th, and commenced by surveying some land suitable for settlement on the north side of Crooked Lake. I also made several trips with a saddle-horse to examine land in the vicinity.

Any attempt to describe more than the salient features of this section of the country would be to assume the possession of a greater knowledge than can be gleaned in the short period I spent in the area, but I am prepared to emphasize my general impression, that the whole of the area, of which I only touched the southern fringe, given good roads, which are a vital necessity, should be a first-class dairying country.

I am informed that the same type of country stretches north for a considerable distance to Canim Lake. The average elevation above sea-level is about 3,900 feet, gradually lowering towards the north. The eastern limit of the area is defined by the Lillooet-Kamloops boundary-line, east of which the country is very mountainous and rough nearly to the North Thompson River. Mr. Drewry, B.C.L.S., in his report on the running of the boundary-line in 1913, speaks in encouraging and prophetic terms of the area to the west of his line. He describes it as: " . . . containing innumerable lakes set like inlays of polished silver in broad valleys rimmed by fir-crowned hills; a great silent country waiting the advent of road and rail to bear the population whose footsteps are even now approaching it."

One of the most interesting facts from the farmer's point of view is the possibility of raising timothy without irrigation on any of the upland country which is now covered with a sparse growth of cottonwood and a rank growth of wild pasture. Mr. Macdonald, who has a large property on the north side of Lac des Roches, has about 300 acres under timothy on the mountain-side, and though the dryness of the past two years has reduced his crop, he has fully demonstrated the possibility of raising enough hay without irrigation to supply dairy stock over a six-months winter. Mr. Macdonald is also very successful over the raising of horses. One settler told me that he cut large crops of hay off the wild pasture; this can undoubtedly be done, but I question the advisability of such a course, since it appears that if this is done the strongest of the wild herbs—namely, the willow-herb, or fireweed, as it is commonly called—predominates the next year to the detriment of the rest.

My observations have led me to the conclusion that tame grasses should be cultivated as much as possible and cut for hay, the wild pasture on the more inaccessable portions being left for summer pasture. I believe that in this way sufficient hay can be raised to feed dairy stock through the longest winter.

The question of root-crops is still, I think, experimental, but Mr. Hanson, at Crooked Lake, had a good garden in July, containing string beans, cabbages, carrots, and rhubarb, at an elevation of 3,900 feet, while Mr. Naff, at Montana Hill, at an elevation of 4,300 feet, had quite

a large crop of turnips, which, however, had not come to maturity at the time of my visit. Mr. Hanson also ripened his small field of oats this year.

In addition to the road from the 70-Mile House to Bridge Lake, a road is now in course of construction from Roe Lake to 83-Mile on the Pacific Great Eastern Railway (Lone Butte). This road is being undertaken by private enterprise and owes its conception and preliminary construction to the energy and enterprise of Mr. Holland, of Roe Lake. This road will reduce the distance from Bridge Lake to the railway by at least 15 miles and a good grade is being secured. Mr. Holland is being assisted in his undertaking by the voluntary labour of a large number of settlers.

My operations then took me south from Bridge Lake to Eagan Lake, and I estimate that there is an unsurveyed area of some 3,000 or 4,000 acres south of and adjoining Montana Lake, and running through almost to Machete or Bear Lake, which might be profitably brought under cultivation. It is possible to obtain good drinking-water at about 6 feet below the surface over this area by sinking wells in the depressions.

All along the north side of Eagan Lake there is a strip of country about a mile wide which would grow good hay when cleared and brought under cultivation. There is a light growth of cottonwood on this land, and springs on the hillside, when developed, would yield additional water if the rainfall is not sufficient here. Cleveland Bros. have a ranch at the western end of Eagan Lake and are raising large crops of timothy, and have developed springs in this way to supplement the rainfall.

From this point I penetrated some miles south of Eagan Lake to survey a pre-emption for Mr. Brown on Red Creek. I found that he had converted a large willow-swamp, by draining and judicious damming, into a meadow in which the timothy was standing waist-high and very thick, but here again outside the actual bottom land the jack-pine predominates, and it appears that the sandy soil of the Bonaparte Plateau covers all but the actual meadow lands. I had no oportunity of going as far as Bonaparte Lake, but from all the inquiries I made I gather that the country round the lake is mostly dense jack-pine.

I had no time this season to visit the east end of Machete Lake, but I am informed that there is in all about 320 acres of good cottonwood land in the vicinity of where the Lillooet-Kamloops boundary crosses the east end of the lake. Some of this lies east of the boundary and some west.

After returning from Eagan Lake I surveyed some land suitable for settlement near the East Twin Lake and near Toby Lake, and another piece between Bridge Lake and Lac des Roches, but had to cut my operations short owing to the extensive programme still to be handled.

Settlement appears to be taking place fairly rapidly in the Bridge Lake area, and two families moved in during the six weeks that I was in the neighbourhood.

Camp was then moved 20 miles west again to survey a pre-emption and a lease which it had been inconvenient to survey earlier in the season, and then on August 18th and 19th camp was moved out to the 70-Mile House, and thence down the Cariboo Road to the vicinity of Clinton and the Lower Bonaparte River.

The Lower Bonaparte River.

Here some ten pre-emptions in all were surveyed, most of which lay in the Lower Bonaparte Valley or on the plateau above it. This locality calls for little description, as there is now practically no land suitable for settlement remaining unsurveyed, with the exception of about 320 acres on Loon Lake Creek and about 160 acres on the Bonaparte River, about 1½ miles north of the junction of Loon Lake Creek with the Bonaparte River. This area is essentially suitable for stock-raising, and the small holdings surveyed this year on the Bonaparte River might form home-sites where enough hay might be raised to feed a few head of stock during the winter.

The lands in the valley of the Bonaparte in the vicinity of the mouth of Loon Lake Creek are situated at a height above sea-level of about 1,500 feet, this being the lowest level of any land which I surveyed this season. Such an elevation renders it possible to carry on market-gardening and fruit-raising in this locality, and I see no reason why the settlers in this limited area should not be able to supply the Clinton market with the hardier fruits, particularly apples.

From this area I moved on September 28th to the Bridge River Valley.

BRIDGE RIVER VALLEY.

This valley is reached from Shalalth Station, on the Pacific Great Eastern Railway, situated on Seton Lake at an elevation of 780 feet above sea-level and about 16 miles west of the town of Lillooet. From this point a road climbs Mission Mountain, and crossing the divide at 3,800 feet, descends steeply again into the valley of Bridge River. This road, which crosses Bridge River near the foot of Mission Mountain, continues up the valley on the north side for about 30 miles, and thence to the mines on Cadwallader Creek, and is the main route of travel to and from the valley. The only other means of access is by a rough trail up the Bridge River Canyon.

The Bridge River Power Company is at this date making extensive surveys in the vicinity of Mission Mountain, and is carrying on rock tests with the aid of diamond-drills with a view to developing power by diverting the water of Bridge River through Mission Mountain by a tunnel 2 miles long and dropping it into Seton Lake. This will give a head of about 1,200 feet. It is estimated that the maximum horse-power which can be thus developed will approximate 400,000 horse-power, thus establishing it as the largest power project in Canada west of the Niagara Falls.

My operations this season in the Bridge River Valley consisted of the survey of pre-emption records, either in or adjacent to the valley, and with the completion of these operations practically all the land suitable for settlement in this area has been surveyed. Most of the land in the main valley is subject to flood in the summer months owing to the fall of the valley not being sufficient to carry off the enormous quantity of water discharged into it from the surrounding glaciers, and only the land which in time past has been raised above the general level by the deposit of silt from the creeks is immune from such flooding. It appears probable that, in the course of operations now being undertaken by the Bridge River Power Company, a very large portion of the main valley will be converted into a reservoir to conserve the surplus summer flow for winter use when the river is low.

The pre-emptions surveyed consisted of two at Tyaughton Lake, 1,100 feet above the main valley on the north side, one at the point where Hurley River enters the main Bridge River, and one on the shore of Little Gun Lake, the lake being situated on a plateau between Gun Creek and the upper reaches of the main river at a height of 3,005 feet above sea-level.

Tyaughton Lake above mentioned is a narrow lake about 3 miles long and averaging between one-quarter and one-half mile in width. The only land suitable for settlement is now covered by two pre-emption records. At Little Gun Lake, in addition to the land covered by Lot 4934, a survey covering a pre-emption held by Matthew Forster, there is about 50 acres of land lying between Gun Lake and Little Gun Lake which might be profitably brought under cultivation. Mr. Forster raises splendid potatoes and vegetables and had a good crop of oats this year.

It may be generally stated that the Bridge River Valley can never become an agricultural area, but the settlers who have land in favourable locations will probably be able to market their produce to the industries which the mineral wealth and natural resources of the area will undoubtedly call into being in the near future, and, this being the case, it is not the area in which intending settlers should look for favourable agricultural opportunities. The post-office is Rexmount, situated 18 miles from Shalalth, on the Bridge River Road, and there is a weekly mail service.

Regarding postal facilities in the areas reported on this season: The Bridge Lake area is served by a post-office at Roe Lake with a weekly mail service. The 70-Mile House Post-office is the nearest to the Bonaparte Plateau area and has a bi-weekly mail service; while Clinton serves the Bonaparte River Valley within a radius of about 12 miles and has a daily mail service.

All the country reported on this season can be reached from the Coast by the Pacific Great Eastern Railway, which has a semi-weekly passenger service. This railway connects with Vancouver by means of the steamers of the Terminal Steamship Company, which ply between Vancouver and Squamish, the Coast terminal of the railway, situated at the head of Howe Sound.

Distances by rail from Squamish to points in the district above mentioned are approximately as follows: Shalalth, on Seton Lake, 105 miles; Lillooet, 120 miles; Clinton, 167 miles; 70-Mile House, 188 miles. There is a cattle-shipping point which serves the Bonaparte Plateau area and Bridge Lake area at the Chasm, 12 miles north-east of Clinton.

The seat of the Government Agent for the district is situated at Clinton, and this is the Land Recording Office for the district.

The minimum winter temperature in the Bridge Lake area and Bonaparte Plateau is about 45° below zero, but it is seldom as cold as this, and when this temperature prevails there is no wind. The minimum temperature in the Bridge River Valley is about 30° below zero.

I closed down my operations on October 21st, and returning to Lillooet, my point of organization, disbanded my party on October 23rd.

I have, etc.,
G. M. DOWNTON, B.C.L.S.

UPPER DEADMAN RIVER AND CRISS CREEK.

BY J. E. ROSS.

KAMLOOPS, December 30th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—My operations this season being confined entirely to the extension of previous surveys in the upper portions of the Deadman River and Criss Creek Valleys, any report on them must, to a large extent, be nearly a repetition of former ones. These lands lie just outside the Railway Belt and are distant from 25 to 40 miles in a northerly direction from Savona and Copper Creek Stations on the Canadian Pacific and Canadian National Railways respectively. The wagon-road which leads from either station has a good hard road-bed, but is rather rough and rocky and sufficiently steep in places to test the climbing powers of an ordinary motor-car. The rise in elevation is close to 3,000 feet. Most of the lands in question have been surveyed and taken up within the last ten years. About one-third of the settlers are making good headway, one-third appear to be at a standstill, and the remaining third were away from their places. The absence of the settlers is probably due to the exceptionally dry weather of the last two seasons and the high wages offered for labour.

Owing to the high altitude the only branches of farming that can be carried on here successfully are stock-raising and dairying. There is abundance and a great variety of summer feed, consisting of pine-grass, peavine, vetches, wild beans, and several kinds of succulent weeds. The difficulty is in securing hay to keep the stock over winter. In consequence the numerous small wild hay meadows scattered throughout the district are much sought after. Viewed from the surrounding hills, these green level tracts appear very attractive, and by some sort of optical illusion are greatly magnified in size. In several instances meadows reported to be 50 or 60 acres in extent were found on a close survey to contain from 20 to 25 acres. Some of these so-called meadows are so lumpy, mossy, peaty, or wet that they are not worth improving. On the whole they are rather disappointing. It is obvious, if the farmers here do not get down to clearing and cultivating the land so that they can grow hay for winter feed, the settlement will never be very prosperous.

The general character of the two valleys is very much alike, but the Deadman is more extensive, extending northerly to the Bonaparte Valley. There is very little broken surface, but a considerable part is so hilly or hummocky that it is not suitable for cultivation. The only merchantable timber is fir and the quantity is negligible. Jack-pine largely predominates; poplar, willow, spruce, and alder come in the order mentioned. The woods are so open that a person by picking out his way could ride or drive from one end of the valley to the other. The bottom lands which lie along the streams, around the lakes, or in some basin which is filled with water for a part of the summer have a rich black loam soil. The soil on the high lands varies from a sandy loam and gravel to a lighter clay loam and is rather poor, especially where the jack-pine grows. It requires to be cultivated for several years before being productive and is much improved by a coating of manure or other fertilizer. Very little timothy, clover, or alfalfa is grown. Experience goes to show that timothy does well for about two years and then runs out. A Mr. Place recently bought several of the best farms on Criss Creek with a view of going into general farming—dairying included—on a large scale. Should he succeed in carrying out his intentions it will be the best test yet made of the farming possibilities of this secton. Both valleys are well watered by streams, lakes, or springs.

The climatic conditions are not so unfavourable as might be expected at this altitude. The summers are pleasant. The greater cold and length of the winter season is compensated by the

absence of winds which usually prevail in the lower valleys. Potatoes are not generally grown on account of the summer frosts, but all the roots or vegetables I saw had grown well. The snowfall is not excessive, seldom exceeding 18 inches.

Many of the stockmen on the Thompson take advantage of the surplus vegetation in this district by placing their cattle and sheep here for the summer months. Among the herds this season was one band of 2,500 sheep.

Criss Creek has a school and post-office. There is no school, post-office, or store in the Deadman Valley. The large number of bachelor residents here explain the absence of a school. The Dominion Government has promised a post-office as soon as a location is decided on, and also the long-distance telephone.

Game continues to get scarcer, but there is no trouble in getting the number of deer that the law allows. Ducks and grouse were fairly plentiful, and the fool-hen was much in evidence, no ammunition being required to get one. Rabbits were scarcer than usual. Some residents devote most of their time to hunting and trapping. Small trout abound in all the streams or lakes. The ease with which the larder can be filled probably accounts for the small amount of time given to the more onerous duties of farming.

From a surveying point of view there is no fault to find with this section of country. The twenty-three lots I surveyed during the two months in the field were either adjoining or adjacent to previous surveys. There still remains a large tract of land apparently fit for farming, but until more signs of prosperity are shown on the lands already taken further surveys would be scarcely justified.

I have, etc.,
JOS. E. ROSS, B.C.L.S.

NICOLA DISTRICT.

BY O. B. N. WILKIE.

MERRITT, B.C., December 31st, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report of the country covered during the past season's work:—

I organized my party at Merritt on May 10th, 1920. Merritt is the principal distributing centre of the Nicola Valley and is a thriving little city on the Kettle Valley Railway. It is about 40 miles in a southerly direction from Spences Bridge, a point on the main line of the Canadian Pacific Railway, and 30 miles from Brookmere, a point on the main line of the Kettle Valley Railway. The Kettle Valley operates trains through Southern British Columbia, connecting at Princeton with United States railway-lines, and giving a direct route to travel from the States through Spokane by way of Princeton to Merritt.

Merritt has a population of about 2,000 inhabitants. It has two first-class hotels and several smaller ones. Business is represented by two large department stores, general stores, two meat markets, a furnishing-goods store, and one drug-store; also a large book store, cafés, garages, and two blacksmith-shops. It has two banks and owns its own water and electric-lighting plants. There are good schools and churches of different denominations and the Government offices are located here. Its principal industries are its coal-mines, which furnish employment for a large number of men, and the Nicola Pine Mills. A large force of men is employed at this mill and its tributary logging camps.

AGRICULTURE.

Merritt is the centre of a growing agricultural community, with good Government roads radiating from it and serving the farmers. General farming is successfully practised, the land requiring irrigation to produce good crops. There is a dry-farming experimental station, which has been in operation for the past seven years, above Quilchena, at the head of Nicola Valley, at an elevation of 3,800 feet. Good cereal crops have been produced there under scientific dry-farming methods.

All the staple varieties of vegetables do well in the valley and all small fruits can be grown successfully. It is not a fruit district, but hardy varieties of tree-fruits can be grown. The Government has a small experimental orchard at Lower Nicola and the trees are doing fairly well. Splendid crops of wheat, oats, barley, and rye are produced, and it is a remarkably good timothy-hay country. The different varieties of clover do well. Alfalfa is being tried out and, although it seems a little hard to get a good stand, does well when established. Poultry-raising is carried on and it is an ideal climate for turkey-raising.

Stock-raising.

It is primarily a cattle country and there are several large cattle-ranches in this vicinity, while all the ranchers go in for stock-raising to a greater or less extent. Until recently the raising of dairy cattle has been more or less overlooked, farmers generally raising beef cattle. But that branch of the industry is picking up and it is found that dairying is a good source of income here. There is a good market for dairy products, the demand being greater than the supply at the present time. Some sheep are raised and from all indications they do well and could be made an important industry. Considerable pork is produced and pigs are raised here very easily, hog-cholera being practically unknown in this locality. There are also some good heavy horses being bred by a few of the large ranches, and these are gradually taking the place of the native "cayuse" raised by the Indians.

There is the best of grazing for stock in the hills surrounding the valley and they run out on the open range till well in the winter. The Government has set aside several large tracts for common grazing lands.

Altitude.

The altitude of the valley within a radius of 15 miles of Merritt is from 1,500 to 2,000 feet, while the upper part of the valley reaches to an altitude of about 2,600 feet. Farming is carried on at an elevation of around 4,000 feet in the mountainous sections surrounding the valley, but these ranches make stock-raising and the growing of hay their principal industries.

Climate.

The climate of the valley of the Nicola is one of its greatest assets. It is truly a valley of sunshine and its clear, bracing atmosphere makes it an ideal dwelling-place for those in search of health. The summers are mild, with cool nights, while the winters are clear and cold, with a medium snowfall. Motor-cars continue on the roads most of the winter season. Summer frosts seldom occur. It is in what is called the "Dry Belt," the average rainfall at Merritt and Nicola being 12 inches.

Mining.

In addition to the coal-mines spoken of, considerable interest is taken in the development of mining for gold, silver, iron, copper, gypsum, etc., in the adjacent territory. A large deposit of bentonite has recently been located.

Description of Season's Surveys.

Our first camp was established about 5 or 6 miles north of Lower Nicola, on the Aberdeen Mine Road, Lower Nicola being the name of the village adjacent to the railway-station of Coyle, on the Kettle Valley line. Here there is a good school, post-office, telephone service, with stores and meat market. There is also a church. The road leading to the Aberdeen Mine, about 11 miles north of Lower Nicola, and which serves the settlers, is a well-travelled, gravelled road.

In this locality we surveyed some pre-emptions and one Government lot. The land surveyed here was principally rolling, bench land, timbered with scattered fir and bull-pine, with an occasional small meadow and poplar-flats. The settlers along the Lower Nicola–Aberdeen Road are developing their places, growing good crops and raising stock. The elevation in this district is from 2,400 to 3,000 feet.

From this point we moved to 8-Mile Creek, on the east side of the Mamete Lake Road, and later to Sheep Creek, where we surveyed several pre-emptions and one Government lot. This is rolling, timbered mountain land, with occasional flats which have good black loam soil. Mr. Winnie, who has resided in this valley for many years, has a large ranch in this vicinity and is raising both sheep and cattle with success. A fair road serves this section and connects with the Mamete Lake Road.

After completing surveys in this vicinity we proceeded to Midday Valley, about 7 miles in a southerly direction from Merritt and reached by a fair wagon-road. Here some pre-emptions were surveyed and also some Government lots. The land surveyed lies along the valley, which is first-class bottom land, with some good cultivable land covered with poplar-growth on the gently rising hillsides. There is splendid timbered pasture land open for grazing purposes adjacent, and in the summer hundreds of cattle and horses range here.

Our next camp was made on Clapperton Creek, where we subdivided several large lots, surveyed some pre-emptions, and laid out one Government lot in Coyote Valley. We also connected and tied in some isolated surveys. The country surveyed in this vicinity rises from an elevation of about 2,900 to 4,500 feet. The general character of the land makes it more suitable for grazing than for agricultural purposes, it being timbered mountain country, with only occasional poplar and willow flats.

From Clapperton Creek we moved, by way of Nicola and Quilchena, along the shores of Lake Nicola, the main Merritt–Kamloops automobile highway following the lake for about 17 miles to the Stump Lake District.

Nicola Lake is a beautiful fresh-water lake, noted for the fine fishing it affords. At the lower end of the lake, about 7 miles in a north-easterly direction from Merritt, is the town of Nicola, which has the distinction of being the oldest town in the Nicola Valley. The Nicola stock-farm, owned by Major Goldman, recently of England, has its headquarters here and is one of the large stock-farms of the district. An extension of the Kettle Valley line from Merritt serves Nicola.

Quilchena, 9 miles farther along the lake-shore, is the headquarters of the Triangle Ranch, owned by the Guichon family, which is one of the most important of the large cattle-ranches in this section. Here there is a store, post-office, and telephone service; also a good hotel.

Along the road between Merritt and Kamloops are several large ranches growing hay, grain, etc., and running large herds of cattle.

In the vicinity of Stump Lake several mines have been opened up, chief of which is the Donohue and the Mary Reynolds, the minerals found being principally gold, silver, lead, and copper. The land surveyed in this locality has an elevation of about 3,500 feet and has a fair amount of good bottom land, the remainder being rolling, lightly timbered pasture land with clumps of poplar and willow-brush. The pre-emptions surveyed here were held by returned soldiers.

From this point we returned along the lake-shore road to within 4 miles of Quilchena, where we took the Douglas Lake Road to near the headwaters of Salmon River.

The country lying between Quilchena and Douglas Lake is rolling, open country, covered with bunch-grass, affording excellent grazing. Douglas Lake is the home ranch of the Douglas Lake Cattle Company, one of the largest cattle companies operating in British Columbia. They have their own store, post-office, and telephone service.

From our new location near the head of Salmon River we made a flying trip in to Fish Lake, which lies between Quilchena and Douglas Lake, where we surveyed some pre-emptions and one Government lot. The country around Fish Lake has an average elevation of about 3,900 feet, and by reason of its altitude is best adapted to the growing of hay and cattle-raising. In the territory adjacent to the head of Salmon River we also surveyed several applications and one Government lot, tying in old isolated surveys. The open bunch-grass country beginning at Quilchena practically terminates here.

We moved from here to establish camp at Minnie Lake, about 40 miles distant in a south-westerly direction; the crew taking a side-trip to Island Lake, where we surveyed an isolated application, tying same to the general system of surveys. There is considerable good willow-bottom land in this vicinity, but owing to the lateness of the season it was not surveyed.

Minnie Lake is situated about 10 miles south from Quilchena and is reached by wagon-road either from Douglas Lake or Quilchena. The work here consisted mainly of the survey of old pre-emption records, held chiefly by returned soldiers. The general elevation of the section is about 3,600 feet, and except for an occasional hay meadow it is mostly timbered, mountain pasture land. Most of the land in this locality was taken up years ago. The Government Experimental Dry Farm lies betwen Quilchena and Minnie Lake.

Upon leaving this district we surveyed a pre-emption adjoining Beaver Ranch, near the head of Nicola Lake; thence proceeding to the lower end of the lake near the town of Nicola, we

surveyed a piece of land bordering the lake, reserved by the Government. After which we returned to Merritt, where we made a tie to the astronomical station established by Mr. Swinburne, of Ottawa, under your authority, to determine the latitude and longitude.

We closed our season's work with the survey of the South Half of Section 3, Township 91.

General Information.

I have only attempted a general description of the work done during the season, as full information in detail is attached to the field-notes of each lot surveyed.

The season this year was an uncommonly dry one during the spring and summer, but rains came on about September 1st and the whole fall has been marked by more rain than usual. Fine fall weather continued on until Christmas, with no really cold weather and practically no snowfall. Stock have been running on pasture and feeding is only beginning at this time (December 31st).

In the Nicola Valley most of the land was taken up years ago by settlers and are now productive ranches. The new settler looking for Government land will have to go farther afield. Throughout all the mountain districts there is bench land and small valleys which make good farms when cleared and put under cultivation. Settlers who have taken up such places are doing well with them. The soil is good and the many small streams and lakes furnish ample water for irrigation. Springs abound that provide the best of water for domestic purposes and feed small spring creeks that often run the year around.

In the winter season hunting and trapping is carried on in the mountains and along the streams. Deer is plentiful, as well as bear, lynx, and coyote. Beaver, mink, and ermine are found along the streams. There are ruffed and willow grouse in abundance, and upon the lakes and along the watercourses ducks and geese are plentiful in the fall of the year.

During the past year two fox-farms have been established, one near Merritt and one near Lower Nicola. The foxes appear to be doing well and considerable interest is being taken in the new venture.

I have, etc.,
O. B. N. Wilkie, B.C.L.S.

VICINITY OF PRINCETON, SIMILKAMEEN, KAMLOOPS, AND YALE DIVISIONS OF YALE DISTRICT.

By P. W. Gregory.

Princeton, B.C., November 27th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit herewith the following report upon the lands embraced in my surveying operations during the past season:—

The work allotted to me comprised the survey of twenty-eight parcels held under pre-emption record, the subdivision of two 640-acre blocks into quarter-sections, and the survey of any new lands in their proximity thought suitable for settlement purposes. Field-work was commenced on June 1st and terminated on October 23rd. In all, nineteen of the twenty-eight pre-emptions were surveyed; the remainder, being unoccupied, unimproved, and unsuitable for settlement, were omitted. Twelve new parcels, nearly all 160 acres each, were laid out. In the case of eight of these, settlers met with expressed themselves ready to make applications for pre-emption entry as soon as possible, whilst I understand that three applications have already been made for allotments on the subdivisions of the 640-acre pieces.

The lands surveyed are widely scattered throughout the Princeton District and my operations necessitated much travelling. In most cases the lands are within reach by road and a motor-car was found particularly useful. In a few instances we were obliged to employ pack-horses, as to the South Similkameen south of Princeton, to Red Creek, and to Missezula Lake.

Additional unsurveyed areas suitable for settlement were noted—namely, south-west of Missezula Lake, south-west of Chain Lake, and on Red Creek, which is a tributary of the Similkameen River north-east of Princeton. On this latter creek J. Collett has made great

improvements on his pre-emption, and his thriving garden and crops illustrate the agricultural possibilities of this particular section of the country. There are a few tracts of land in the vicinity of the town of Allenby, formerly held under timber leases, that have now been logged off and which should be subdivided for settlement.

Regarding the physical characteristics of the areas dealt with, no general description to meet all cases is possible. The lands surveyed along the Similkameen River south of Princeton range in elevation from about 3,300 feet above sea-level to 4,000 feet, and consist, some of fairly level jack-pine bench lands adjoining the river; some of rolling grassy hill-tops indented with frequent sloughs or wild hay swamps, poplar, willow, and alder bottoms, and skirted by steeper-timbered slopes, on which fir from 12 to 40 inches in diameter predominates. Extensive patches of second-growth fir, pine, and spruce occur throughout. The wild grasses on some sections are enriched with an abundant growth of peavine and vetch and many descriptions of wild berry-bushes are to be found in profusion.

The lands surveyed on Red Creek lie at an elevation of between 3,400 to about 4,000 feet above sea-level. They are mainly jack-pine flats bordered by low hills. A considerable area of this land was burnt over by forest fires which raged through the locality in 1914, and it is for that reason capable of easy clearing. It can also be readily brought under irrigation from Red Creek.

The lands surveyed in the vicinity of the Otter Valley lie at an elevation of about 3,200 feet above sea-level or about 500 or 600 feet above the Otter Creek. They consist of rolling hill-top lands, on which lie some wild swamp-hay meadows and which break downward to the valley below in steep and somewhat rugged slopes more or less densely covered with second-growth fir and pine.

A few pre-emptions were laid out in the neighbourhood of the Tulameen Townsite, varying from flats along the river-bank of a light sandy soil and sandy loam to hill-top land of a richer character, carrying a growth of grass and peavine, with frequent clumps of heavy poplar, willow, and alder.

As to the accessibility of these lands, if not within easy reach by one or the other of the several roads leading from Princeton, they lie in most cases but a few miles beyond by trail.

Princeton, the principal town of the Similkameen, lies at the confluence of the Tulameen and Similkameen Rivers, and roads passing from it up and down each of their valleys, and up several of the valleys of their tributaries near Princeton, make the town in effect the converging point of the district and a natural trading centre. It has a population of about 1,000, with school, four churches, two banks, three hotels, fraternal hall, garages, and all the usual stores.

The highway, which was surveyed nine years ago as the Trans-Provincial Highway, passes through Princeton, and proceeding in a south-easterly direction down the Similkameen Valley through Hedley and Keremeos it connects with all the main roads of the Interior leading northward, and with those proceeding southerly into the State of Washington. In view of this it becomes an easy matter for the motor traveller to reach such equally important places as Merritt, Kamloops, Penticton, Kelowna, and Vernon. Both Kamloops and Vernon may be reached fairly easily in a day's drive from Princeton. An important road which has recently been opened for travel is the one running northward from Princeton along the 1-Mile Valley to Merritt. This new road reduces the distance between these points to 55 miles, effecting a saving over the old route via Otter Valley of 16 miles, and what is perhaps of greater importance, eliminating the succession of forbidding-looking hills that occur on the old highway, one of which, apart from being lengthy, has a gradient of about 19 per cent. and is in a like proportion dangerous.

In the matter of railway facilities Princeton is well provided, being situated on the main line of the Kettle Valley Railway and nine hours' journey over that system to Vancouver. By its means the Okanagan, Boundary, and Kootenay Districts are brought within easy reach, whilst the Vancouver, Victoria & Eastern Railway Company, using Princeton as its northerly terminus for the time being—it is expected that it will at some future date inaugurate an extension of that service over the Kettle Valley Railway to Hope, and thence over the Canadian National Railway to Vancouver—runs a tri-weekly service to Oroville and Spokane. A branch of the Kettle Valley Railway runs from Princeton in a southerly direction to Allenby, 4 miles, and Copper Mountain, 14 miles. These points are respectively the milling and mining towns established by the Canada Copper Corporation, Limited.

Mining is an important industry of the district. The Princeton Coal and Land Company, Limited, is operating a coal-mine near to the town, employing about eighty men. It ships its product to Vancouver, Victoria, Wenatchee, Spokane, etc., besides most towns in the Okanagan and Kamloops Districts. There is another coal property adjoining the town under development, and at Coalmont, 13 miles west, the Coalmont Colliery is mining and shipping, besides carrying out an ambitious scheme of development intended to increase its output to 1,000 tons per day. The copper-mine at Copper Mountain and the concentration-mill at Allenby will probably employ in the neighbourhood of 400 men. Eight years have been spent in development and construction and operations have only recently commenced. Power for the undertaking and the light and power for the town of Princeton is furnished by the Okanagan Power and Light Company (West Kootenay Light and Power Company), which has just recently completed the erection of its 200 miles of transmission-line from the Bonnington Falls, West Kootenay.

With regard to farming, there is a good market locally for most produce. Cream is shipped to Grand Forks, as there is no local creamery. Cattle-raising, dairy-farming, and mixed farming generally are engaged in. Root-crops do very well and most varieties of garden produce are grown successfully. Some of the local ranchers have made good returns from the growing of strawberries, for which there is a good local market. Potatoes raised are the equal of the best Ashcroft varieties.

There is good grazing to be found, particularly so in the mountain section between Princeton and Hope. A local syndicate this year imported a large flock of sheep which they turned out to graze in that district. Although the venture was not especially profitable this first year, I understand that with the necessary experience gained its possibilities are apparent and the experiment will not be allowed to drop.

With regard to timber, the merchantable varieties consist of fir and yellow pine, usually running from 12 to 40 inches in diameter. Yellow pine has for the past four years been in good demand, and many settlers have, with the additional advantage to themselves in the clearing of their lands, logged off their pre-emptions, selling the timber to the local and Merritt mills. There are four mills taking local logs—namely, the mills of the Summerland Lumber Company at Allenby, the mill of the Coalmont Colliery at Coalmont, a small mill at Princeton, and the Nicoa Pine Mills at Merritt. There is a good local demand for mine-props and railway-ties, whilst of added importance to the pre-emptor is the fact that he usually has timber in plenty for the erection of farm buildings and rails for fences. Generally the cost of clearing land runs from about $25 to $50 per acre.

Rainfall and snowfall are both moderate. During December, January, and February snow usually covers the ground, its greatest depth varying from 18 to about 30 inches. This condition extends through the month of March at the higher elevations.

In regard to game, grouse and duck are usually plentiful; grouse were especially so this year. Both deer and bear were seen on several occasions during our operations. Good fishing is available within a short distance. Blue Lake, 13 miles from Princeton on 1-Mile Creek, was this season stocked with trout-fry by the authorities and the lake has been closed for fishing for a few years.

During the month of September we experienced unusually frequent rainfalls, and as a consequence the rivers were flooded to a capacity almost equal to the spring freshets. In the vicinity of Tulameen, where placer-mining is carried on, the placer-miners were obliged to suspend operations for several weeks.

I have, etc.,

P. W. Gregory, B.C.L.S.

VICINITY OF PRINCETON, HEDLEY, AND KEREMEOS, SIMILKAMEEN DIVISION OF YALE DISTRICT.

BY A. E. HUMPHREYS.

CHILLIWACK, B.C., December 4th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—Acting on your instructions, I proceeded on July 9th last to make surveys of pre-emptions in the vicinity of Princeton, Hedley, and Keremeos. This area is reached by taking the Kettle Valley Railway through Hope to Princeton. From there the Great Northern Railway runs a mixed train every second day through Hedley, Keremeos, and south. There is a good wagon and automobile road from Princeton to Keremeos, following the Similkameen River.

Work was started on two pre-emptions on Coldwater Creek, about 7 miles south-east from Princeton. It would appear that land in this locality would be most suitable for ranching and that the better land has already been taken up. It is necessary to irrigate to raise field or garden crops. Business conditions appear quiet at Princeton, but with coal-mining at Coalmont and copper-mining at Copper Mountain, 12 miles south, there should be a ready market for any crops or stock grown. A branch railway-line has been completed from Princeton to Copper Mountain and hydro-electric power has been brought from Bonnington Falls, and this should now be a large copper-producing property.

Four pre-emptions were surveyed in the vicinity of Hedley. This land was at an elevation of 1,200 feet above the Similkameen River and is suitable for growing hay and furnishing range for stock. Summer frosts have destroyed gardens for the last four or five years, but potatoes, etc., were grown this season.

The valley of the Similkameen River is narrow, but if water can be had for irrigation splendid crops can be grown, which find ready market in Hedley, where the Nickel Plate Gold-mine is in operation. This mine has since closed down temporarily.

Two pre-emptions were surveyed on Paul Creek, about 4 miles west from its junction with the Similkameen River. This is good land and suitable for hay and range. There is good range country adjoining on the west. There is a pack-trail in from the river and the land is mostly open rolling country.

The remainder of the season was spent on the Ashnola River, which joins the Similkameen River about 7 miles above or west of Keremeos.

A fair wagon-road has been constructed up the Ashnola River about 9 miles to the forks, and then farther up the Ewart Creek. This road is closed at 5 miles by rock and gravel slides, but could easily be put in good shape. A pack-trail continues on up the Ashnola River to the International Boundary, which it crosses about 32 miles from the Similkameen. The last 3 miles of this trail is closed by windfall.

There is no mining activity here at present; some claims, apparently copper prospects, have been staked about 5 miles up the Ashnola, but little or no development-work done. Tungsten is said to have been discovered up Ewart Creek, and it was for this reason the wagon-road was constructed. No ore was shipped and no work is going on now.

The valley of the Ashnola is narrow generally, less than half a mile in width, sides being steep gravel or rocky hillsides. The soil in the valley is mostly sand loam and suitable for hay or field crops, but requires irrigation. This valley is most suitable for cattle-ranching, there being some excellent summer range on the hills, while the valley will supply winter feed. About 800 head of cattle were on the ranges this year.

There are small quantities of merchantable timber, consisting of scattered fir and red pine, on the hills and benches and fair spruce in the creek-bottoms. Land could be cleared for about $30 per acre.

The rainfall in this area is very light, there being only three light showers during July and August, and there is no evidence of excessive snowfall. Snow fell at the International Boundary (elevation 4,500 feet above sea-level) on September 25th and there was quite a heavy fall on the higher ranges. This was earlier than usual. No summer frosts were noticed, but it is probable that they occur in the upper part of the valley. During July and August the highest temperature recorded was 104° in the shade.

Game is rather scarce; a few deer were seen, but they were reported to be considerable in number on the higher levels; also some mountain-sheep. Cougar-tracks were frequently seen and a few black bear in the upper part of the valley. Grouse were seen, but are not plentiful. Splendid fishing, speckled trout, may be had in the Ashnola. The lower 5 miles appears to be fished out, but above that the fishing is good.

I have, etc.,
A. E. HUMPHREYS, B.C.L.S.

VICINITY OF LOWER SIMILKAMEEN VALLEY.

BY C. Æ. SHAW.

CAWSTON, B.C., December 15th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on surveys made by me in the Lower Similkameen District during the season of 1920:—

In all, thirty pre-emptions were surveyed; of these, four belonged to returned soldiers; the total area amounted to 4,780 acres; in addition to this, four tie-lines were run, the first near Aldergrove, the second at Yellow Lake, the third on the Lower Similkameen River, and the fourth on the International Boundary-line at Osoyoos Lake. The work was very scattered, involving a large amount of travelling over in many cases exceedingly hilly roads.

These pre-emptions were all high up in the hills, as all the good land in the valleys has been taken up for some years; and as a sequence to a long succession of dry seasons most of the springs and creeks were dried up, it meant many long walks and hard climbs from the camp at the nearest spring to the work, besides having to carry all the water required during the day.

At the request of several intending settlers a number of pre-emptions were surveyed on the summit between Cawston and Fairview; most of these were on the western slope of the mountain. The soil is of the very finest quality, deep black loam, and the luxuriant growth of grass and weeds remained green until the end of the season, while in the valley below everything was burnt and dried up by August. It is a remarkable fact that all through the district the finest soil—usually a deep black loam—is high up in the hills, while that in the valleys usually consists of clay or sandy loam, often with gravel or boulders for subsoil.

The season was a very unusual one for this district; a cold, backward spring followed by intensely hot, dry weather in July and August, while the months of September and October were the coldest and wettest ever known in the Similkameen, with the result that a large proportion of the tomato-crop failed to ripen, not much over a third of the usual quantity being packed; this was a very serious loss, as tomatoes are very extensively grown in the district. However, the fruit-crop was large and of very fine quality.

While the rains in the fall made surveying operations very disagreeable and caused considerable delay in the work, they were of immense benefit in other ways, as they put out numerous bush fires—one of which, on the east side of Osoyoos Lake, had driven us from the work—and have replenished the sources of the dried-up springs, thus greatly improving the prospect for next season's crops, and lead one to hope that the long succession of dry seasons this district has suffered from is broken.

Deer were frequently seen during the progress of the work. Blue and willow grouse were quite plentiful, and the Chinese pheasants which were introduced into the Similkameen Valley about eight years ago have become very numerous.

I have, etc.,
C. Æ. SHAW, B.C.L.S.

VICINITY OF OKANAGAN LAKE.

BY A. P. AUGUSTINE.

PENTICTON, B.C., December 22nd, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I beg to submit the following report of the surveys and examination of land suitable for settlement in the vicinity of Okanagan made during the summer of 1920:—

My operations consisted of the survey of twelve pre-emptions and five parcels of Crown lands deemed suitable for settlement, and one beacon-site on the Okanagan Lake shore, comprising altogether some 2,920 acres. Of the twelve pre-emption records surveyed, only three—Lots 2723s, 2725s, and 4772—have been developed. There is a shack on Lot 2730 which was built by contractors during the construction of the Kettle Valley Railway. However, the holders of these pre-emptions, which have no improvements, appear to be returned soldiers.

The country generally consists of undulating land timbered with fir and yellow pine, interspersed with beaver meadows, sloughs, alder and willow bottoms. On the higher levels there are large areas covered with jack-pine varying in size from 2 to 8 inches in diameter. Some of the recorded pre-emptions have portions on high hills, but in every case parts are capable of being brought under cultivation, although I have my doubts as to the emolument emanating from such work.

The soil on the lower parts of Lot 4772 is volcanic ash, but sandy loam, with black loam in the bottoms and beaver meadows, prevails elsewhere.

All the portions outlined as being possibly fit for settlement were investigated with a view to surveying for future settlement, but very little was deemed suitable on account of its being too rough or because it carried too much timber.

Land lying to the south of Pre-emption Record 3398 is too steep for settlement and too rocky, and that to the east of the same pre-emption, while suitable for settlement, has a stand of good yellow pine in places which in my estimation would run over 8,000 feet per acre. The South-west Quarter of Section 17, Township 28, is for the most part a bald rocky hill, rising abruptly from the shore of the Okanagan, and is worthless from an agricultural standpoint.

Land lying in the vicinity of Squally Point, between Lots 2521s and 1158s, is very precipitous, rocky, devoid of soil, and useless, although one lot was surveyed in the Squally Point Canyon, north of Lot 1158s. This lot, though badly broken on the north-west and south-east corners by the walls of the canyon, has some good level sandy loam in the bottom. It is through this canyon that the proposed Penticton–Kelowna Public Highway runs for 4 miles at a practically level grade, and if constructed this road will form the main automobile artery joining the two towns.

Upon examination of the land lying to the south of Sub-lot 27, Lot 2711, I found that there would probably be one parcel suitable for settlement, but was in doubt as to the stand of timber and reported accordingly. Land in the vicinity of Sub-lot 4, Lot 2711, was not surveyed, as it was found to be without access by wagon-road, over 3,500 feet in elevation, and limited to one pre-emption.

At Adra, on the Kettle Valley Railway, are possibly two parcels suitable for settlement, but at a greater height than 3,500 feet. At Chute Lake three lots were surveyed—namely, Lots 2732s, 2733s, 2734s. The soil on these lots is the typical light sandy loam, with black loam in the beaver meadows. The timber is thick jack-pine, with the bottom lands for the most part covered with willow and alder. Irrigation is not practicable on these lots, but owing to the heavy snowfall at this altitude (4,000 feet) it is doubtful if irrigation would be necessary.

It has since been reported to me that there are four or five parcels of unrecorded, unsurveyed Crown lands south-west of Lot 3780, Osoyoos District, suitable for settlement, and according to the same report this land would be eagerly sought after if surveyed and thrown open.

Considerable time was lost in transportation from one job to another, the party having moved by motor-launch 25 miles, steamboat 68 miles, by wagon 25 miles, by auto-truck 40 miles, and by railway 135 miles, making a total of 293 miles, mostly in short stages, in addition to motor-boat and rowboat travelling from camp to work.

I have, etc.,
A. P. AUGUSTINE, B.C.L.S.

VICINITY OF LUMBY, OSOYOOS DIVISION OF YALE DISTRICT.

By J. C. Agnew.

Vernon, B.C., December 3rd, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report regarding the areas in which I was engaged surveying during the past season:—

The work consisted of surveying detached pre-emptions, chiefly in the watershed of the Shuswap River, only three places being outside that area. The season was remarkable for the heavy rainfall and the number of mosquitoes and gnats, which considerably retarded the progress of the work.

On June 21st operations were commenced 12 miles north of Vernon, where one pre-emption was dealt with. From there camp was moved to the east side of Long Lake, 7 miles south of Vernon, where two places were surveyed.

On July 13th we moved east into the Shuswap area and arrived at Trinity Valley, which lies to the south of the Railway Belt and east of Mabel Lake. Owing to the plague of mosquitoes there we were forced to abandon the survey commenced and return later to complete it.

Trinity Valley.

Trinity Valley contains a large area of farming land, nearly all of which appears to have been alienated. At one time there was quite a number of settlers, but now only a few of these remain. The chief cause of this is the rather long winters obtaining there and the absence of a school. There is a good road all the way from Lumby through the valley to Enderby. The elevation of the valley is approximately 2,500 feet, but the snow appears to lie there longer than in other parts of the Shuswap River watershed. A post-office is situated near Bobbie Burns Mountain and the mail is carried once a week to Lumby. When the Canadian National Railway branch is in operation at Lumby this valley may have more attractions for settlers.

Creighton Valley.

On leaving Trinity Valley camp was moved to Creighton Valley, the entrance to which lies about 4 miles south-east of Lumby. Here we surveyed two pre-emptions. This valley is only about 20 chains wide at the most and narrows considerably as the eastern end is approached. A considerable quantity of hay is grown in the bottom land and the settlers appear to be prosperous. There is good bunch-grass range all along the slopes north of the creek. The climate is warm and dry in summer and the valley has a very moderate snowfall, generally 2 feet.

Harris Creek (South-west of Lumby).

On completion of the pre-emptions in Creighton Valley camp was moved to another pre-emption, 4½ miles south-west of Lumby, on Harris Creek. Around this part the land appears to be well settled. After the war several soldiers took up land in this neighbourhood under the Soldier Settlement Board and are apparently getting along satisfactorily. The proximity to the Lumby branch of the Canadian National Railway, together with the productive soil, makes this part a desirable location for those who wish to be near transportation.

Ireland Creek.

From Harris Creek we moved to Ireland Creek, south-east of Mabel Lake, and there surveyed one claim. Ireland Creek lies in a small valley about 300 feet above the Shuswap River, which the creek flows into. Here the chief product is hay, but owing to the distance from transportation cattle are raised, as there is some good range on the east side of the creek. Most of the land in this valley is taken up. The climate is dry in summer. The winter commences in November and lasts till April. The snowfall is usually about 3 feet. The school is at Mabel Lake Post-office, close to the junction of Ireland Creek and Shuswap River Road.

Shuswap River.

From Ireland Creek we proceeded up the Shuswap River 15 miles to Township 45, 3 miles west of Camagna, where we were engaged in retracing old section-lines. At this part of the river the mountains rise abruptly, giving room for a few small benches of very limited extent.

The climate here is very dry and without irrigation the land is of little use, and the range is also poor, being of the timber-grass variety. Lumby, where the nearest store is, is 15 miles away. A rural delivery route supplies mail facilities. There is also a post-office at Camagna, where the local school is situated.

FERRY OR 8-MILE CREEK.

On leaving Shuswap River we proceeded up Ferry or 8-Mile Creek, 1½ miles south of the Creighton Valley Road, where we surveyed two lots. Ferry Creek lies in a gorge. At the part we were working in the mountain rises abruptly on the west side. Although steep, the eastern side of the creek affords some good bunch-grass range. Very little of the creek-bottom could be utilized. The nearest road is that passing through Creighton Valley, from 1½ to 2 miles north of the lots. At present the only means of access is a trail along the eastern mountain-side, but a road could be made up the creek-bottom at reasonable cost. In elevation this part of the creek is in the neighbourhood of 3,000 feet. There is not a very heavy snowfall, about 4 feet. The climate is warm and dry in summer. To Lumby the distance is 19 miles. A rural delivery, twice weekly, passes along the Creighton Valley Road. The nearest school and post-office are at Camagna, 9 miles away.

HARRIS CREEK (SOUTH-EAST OF LUMBY).

On September 4th we moved camp to a place 2 miles south of the eastern end of Creighton Valley, in the Harris Creek area. Here we surveyed three claims. These are all beyond road communication. The first two claims are adjacent and occupy a high bench above Creighton Valley. The third claim lies on Bear Creek, a tributary of Harris Creek. The land in this vicinity is rather rough and broken. This area has been taken up chiefly for timber and range, leaving little room for pre-emptions. There are no actual settlers where we were working. The places were occupied prior to the war, but are now deserted. The climate is dry in summer, but there is a heavy snowfall, commencing as a rule early in November and lasting well on into April. Good trails connect the places surveyed with the nearest road, from where it is not more than 5 miles to Lumby, where the nearest school and post-office are situated. The trail to the Bear Creek claim is about 6 miles long.

TIMBER.

The timber throughout the areas dealt with is all much alike in kind—viz., fir, tamarack, cedar, and spruce. White and yellow pine are occasionally met with.

GAME.

The game hardly varies throughout these areas, the animals comprising mule-deer and black and grizzly bear. The game birds are blue and willow grouse, prairie-chicken, and fool-hen, and duck of many varieties. The Shuswap River contains rainbow and silver trout and in some of the smaller streams brook-trout are abundant.

GENERAL.

With the exceptions already noted, the whole of the area dealt with is well supplied with good roads. Reasonable post-office facilities are available to all settlers. Excepting in Trinity Valley, schools are suitably situated throughout the district.

Lumby, the marketing village, will shortly be in railway communication with Vernon, which will no doubt give considerable impetus to the development of this district.

I have, etc.,

JAMES C. AGNEW, B.C.L.S.

KETTLE RIVER VALLEY AND VICINITY.

By K. C. Farrow.

Vancouver, B.C., December 28th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on the area embracing my season's work in the Similkameen District:—

The lands surveyed are scattered over a large extent of country, and all lie either in the valley of the Kettle River or on creeks tributary thereto. Taking the little town of Rock Creek as the centre, the following table gives a rough idea of the scope of country covered and the distances to the various localities in which the work lay:—

	Miles.
Rock Creek south to Myncaster	6
Rock Creek west to Johnson Creek	8
Rock Creek west to Camp McKinney	25
Rock Creek north to Lakevale (up the West Fork of Kettle River)	62
Rock Creek north to Christian Valley (up the main Kettle River)	45
Rock Creek north-east up Nicholson Creek	14
Rock Creek east to Greenwood	20

The roads to all the above places radiate from Rock Creek, with the exception of the Main River Road, which leaves the West Fork Road at Westbridge, 9 miles north of Rock Creek.

Physical Characteristics.

The main river flows south and a little west from the Christian Valley to its confluence with the West Fork at Westbridge; thence east to Midway, where it turns south and crosses into the State of Washington. The West Fork flows nearly south from its source at the Kelowna Summit, where the Kettle Valley Railway breaks through into the Okanagan Valley. The main river-valley where it is known as the Christian Valley—that is, from the East Fork for about 8 miles south—is flat and averages a mile wide, with high and more or less rocky mountains rising on either side. The valley-bottom here is about 2,500 feet elevation and the mountains rise some 2,500 to 2,600 feet higher on either side; below here and down as far as Westbridge the valley alternately narrows (in many places to a mere canyon) and widens to about half a mile in width; the mountains on either side continuing about the same height, but becoming less rocky and their slopes broken by benches. From Westbridge through Rock Creek and on to Midway the valley varies in width from three-quarters to a mile, and the hillside benches become more frequent and larger. At Rock Creek the valley has an elevation of 1,950 feet west from Rock Creek to Bridesville; after climbing sharply out of the valley for about 1,000 feet there is an undulating belt of country gradually rising to Bridesville at an elevation of 3,500 feet. This area is cut by Rock Creek, which for 5 miles above its confluence with the Kettle flows east through a picturesque canyon some 500 feet deep.

Boundary Creek (upon which Greenwood is situated) flows into the Kettle at Midway; its valley is narrow, widening only in a few places to about a quarter of a mile; there are, however, considerable areas of bench lands on either side. This area is considerably marred by the sulphur-fumes from the Greenwood and Boundary Falls smelters having killed off most of the vegetation, particularly standing timber, which gives it a particularly desolate appearance.

Climate.

The climate through this area varies considerably. Midway appears to be the hottest in summer and coldest in winter, with Rock Creek next and Greenwood and Bridesville following; 35° below zero and 105° in the shade appear to be midwinter and midsummer temperatures at Midway, although these extremes are only reached for short periods. Farther up the river the extremes are not so great; Christian Valley having recorded 25° below zero when Midway was 40° below. The snowfall from Greenwood to Westbridge averages about 18 inches in the valley, with, of course, more on the surrounding hills. From Westbridge up both the West Fork and main river there is considerably more snow, averaging 3 feet in Christian Valley. The rainfall is also much heavier from Westbridge north up both the main river and West Fork; this is

plainly evident from the vegetation, which becomes sparse below Westbridge, with large expanses of open bunch-grass hillside, while above Westbridge the growth is heavy, with considerable willow, maple, and alder.

TIMBER.

There are considerable areas of merchantable timber—fir, tamarack, and yellow pine—principally up the West Fork and main rivers from Westbridge. Last winter about 3,000,000 feet were cut and in the spring driven down the Kettle to the mills at Grand Forks. This gives employment to a considerable number of men. There is also a good deal of tie-timber which provides employment to many ranchers before they get their pre-emptions on to a paying basis. The Canadian Pacific Railway and Great Northern Railway take all the ties that can be supplied; apparently these are all hewn in the woods.

ROADS.

This whole area is blessed with good roads compared to most other parts of the Province. The Trans-Provincial Highway runs through Bridesville, Rock Creek, Midway, and Greenwood and is a good motor-road. Up the river there is a good motor-road through Westbridge and up the West Fork to Carmi; from there on through the pass to Penticton is only an indifferent wagon-trail, which is, I understand, being gradually improved. Up the main river the road becomes gradually worse above Westbridge until in Christian Valley it is merely a pioneer wagon-trail. It is passable for cars; in fact, I took my outfit up as far as Copper Creek by car, but there was little pleasure in the achievement. Many tributary roads—for the most part good—act as feeders to the main roads; in particular Johnson Creek, Nicholson Creek, and Rock Creek to Myncaster.

GAME.

Good trout-fishing can be had anywhere in the Kettle River and up most of the larger tributary creeks. Deer and bear were scarce this year close in to the settled areas, but abounded farther up the river above Westbridge; grizzly are found up the Christian Valley; blue and willow grouse were not plentiful, but spruce-hen were found in numbers in many places.

EARLY DEVELOPMENT.

The southern and eastern portion of this territory is one of the earliest-settled districts in British Columbia. Apart from scattered stock-ranches, this early development was largely due to mining activities, out of which the towns of Midway, Greenwood, Phoenix, and, farther east, Grand Forks grew to considerable size and importance. The Canadian Pacific Railway built into Greenwood in about 1900 and the following year extended to Midway; this line a few years ago was extended via Penticton, Princeton, and Hope to the Coast, and is known as the Kettle Valley Railway. The Great Northern Railway also touches Midway and passes close to Greenwood and Rock Creek, so that the district is well served with railways.

MINING.

Copper was the mineral mined to the greatest extent in this district until two or three years ago, and large smelters operated at Boundary Falls, Greenwood, and Phoenix. Of recent years, from various causes, these smelters have closed down and been dismantled, likewise the mines which supplied them. This has been a serious blow to the district in general, and many people are now looking to the agricultural possibilities of the country to repair their fallen fortunes. Not that it is mined out by any means; old-timers—miners and prospectors—are confident of a mining revival sooner or later, and a number of small silver-mines are operating on a very paying basis at the present time and mineral indications exist everywhere.

AGRICULTURE.

To turn now to the agricultural development and possibilities of the district: Much pioneer work has been done and many flourishing ranches exist, especially between Midway and Rock Creek and Bridesville. They are mostly stock-ranches, where hay and oats are naturally the principal crop, though a considerable amount of grain is raised and threshed, particularly in the Bridesville area, and in normal years the crops are good. Three successive dry seasons have made the farmers look closely to the possibilities of irrigation, which hitherto has only been

carried on here and there. It is increasingly evident, though, that a comprehensive system of irrigation will be needed before the Kettle Valley can attain to a full agricultural development. The soil is there and the water also, but it remains for the individual efforts of isolated ranchers to be co-ordinated and a system installed which will benefit the entire valley. This could, of course, best be done by the Government and is certainly worthy of its consideration. The raising of apples has been tried between Midway and Rock Creek, but spring frosts have been found fatal to the blossom. Judging, however, from the wild strawberries and raspberries found everywhere, small fruits should do well. The foregoing applies particularly to the valley-bottom. The benches as a general rule are favoured by a certain amount of sub-irrigation and appear to be less affected by dry years than the valley-bottom. Many good ranches are dotted about on these benches. Most of the lands surveyed by me this season were back from the valley itself on benches or tributary creeks; the valley itself having been taken up and surveyed in some cases many years ago.

Localities surveyed.

I will now deal more particularly with the local areas in which the work lay and the sequence of the work itself. I arrived at Rock Creek, my point of organization, on the evening of Saturday, June 12th, having motored in from the Coast, bringing two men in with me. I commenced at once to organize my party and commenced actual field-work on Tuesday, the 15th, in the vicinity of Myncaster, where I surveyed three pre-emptions. These lie on a more or less steep mountain-side and are suitable only as range; they adjoin several prosperous farms which lie in the valley of Myers Creek. Having completed these, I moved up to Carmi, 45 miles up the West Fork of the Kettle River along the Kettle Valley Railway. In this locality I surveyed two pre-emptions and three Government lots. The country here is less suited for agricultural development than farther south, the valley being narrow and for the most part stony and the arable lands scattered and of small extent.

There is considerable mining development going on in the vicinity, several small silver-mines operating on a paying basis. There is also considerable tie-cutting and logging.

I next moved up to the Arlington Lakes, 17 miles above Carmi. I had to make this move by rail, as the wagon-trail was not passable at that time owing to windfalls. Here I surveyed two pre-emptions and a Government lot. The country here is similar to that about Carmi, but has a heavier rainfall.

I then moved south again, retracing my steps as far as Beaverdell, 10 miles south of Carmi, where I surveyed a Government lot. I had a pre-emption to survey here, but found it had been abandoned. I then moved on south and camped at Bull Creek, where I surveyed a pre-emption. Up till this time I was considerably hampered through having no assistant; while at this camp, however, Mr. Agassiz arrived and assumed his duties.

Continuing south, I camped at the mouth of Conckle Creek, 4 miles above Westbridge, where I surveyed three Government lots, all on benches above the main valley and each containing a certain amount of arable land, the balance of the area being range. I then made a move of about 35 miles through Rock Creek and Bridesville, and camped about 8 miles from the latter place and between it and old Camp McKinney on the old Camp McKinney Road. I had previously made a two-day's trip into this area by myself and looked it over. I surveyed nine Government lots here in a block. They lie in a basin which forms the headwaters of Rock Creek, and which lies at the foot of Mount Baldy, the highest peak in this district, 8,000 feet high. Old Camp McKinney lies on the slope of this mountain, one of the oldest mining camps in this district; it is reputed to have produced over $1,500,000 in free-milling gold in its time, but has long since closed down and been deserted as a settlement, although several small properties are being worked. The old road upon which I camped is in fair condition and passable for wagons to within 2 miles of McKinney. The basin is undulated and traversed by several small creeks. The soil throughout is a good sandy loam, naturally moist. There is a dense growth of willow and alder, a considerable amount of fir and tamarack, and occasional patches of jack-pine. The clearing would be heavy and more or less expensive at present costs. The elevation is about 4,000 feet, about 200 feet higher than many of the farms about Bridesville, which is the centre of a prosperous farming community.

I then moved back towards Rock Creek and camped up Johnson Creek. In this locality I surveyed one pre-emption and eight Government lots. Later I returned and under instructions from you surveyed another pre-emption and Government lot. These lie for the most part on an

undulating plateau between Johnson Creek and Kettle River. The soil varies from a loam to sandy loam and is naturally moist. There is a heavy growth of willow, alder, and maple throughout and a certain amount of fir and tamarack. The clearing would be heavy, but when cleared the land would produce good hay-crops. From Johnson Creek I moved over 50 miles up to Christian Valley on the main river, stopping en route at Williamson Creek to survey a pre-emption and a Government lot, both situated on benches above the river.

In Christian Valley I surveyed some pre-emptions and one Government lot. The valley here is wide and the soil a heavy loam, varying to an alluvial silt and naturally moist. There are six families in there now, though it is still more or less of a pioneer settlement, being 35 miles from the railway at Westbridge. There is a school and they are applying for a post-office. It is by far the most promising area that I visited this season from an agricultural standpoint; in my opinion it is superior to the older-settled districts farther south, and has the advantage of considerable areas of arable land still vacant and unsurveyed. The clearing is not so heavy as in other parts and the rainfall is considerably greater.

After I returned to the vicinity of Rock Creek I had many inquiries as to the possibilities of the district. One rancher, who is at present working a rented ranch, told me that as soon as he heard that further Crown lands were open for pre-emption up there he would move up with his two sons and also send for a brother and two friends, who are on the Prairies and to whom he had promised to look out for good land. This was after he had asked me about the district and then gone up to look it over. He was most enthusiastic about it. I should like to have surveyed some vacant Crown lands here, but unfortunately was too pressed for time. Game abounds in the district, deer being more plentiful than for many years.

I then moved back down to Johnson Creek, where I completed the work under instructions there, and then proceeded up Nicholson Creek, where I surveyed four Government lots. Nicholson Creek flows into the Kettle River from the north almost opposite Rock Creek. There are several prosperous ranches situated on it. A fairly good road runs down to Rock Creek. Three of the lots I surveyed, when cleared, would be arable; the fourth is more suitable for range.

Moving west to Boundary Falls, I surveyed a pre-emption and a Government lot, both situated on benches high above Boundary Creek. Then moved on to beyond Greenwood up Boundary Creek, where I wound up my season's work by surveying a Government lot.

My chief difficulty throughout the season's work was picking up the old lines and corners, in many cases almost wholly obliterated. In most cases as much time was taken up in getting a start as in making the survey itself.

I have, etc.,
K. C. FARROW, B.C.L.S.

VICINITY OF GRAND FORKS, SIMILKAMEEN DIVISION OF YALE DISTRICT.

BY A. H. HOLLAND.

VANCOUVER, B.C., December 4th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—The season's work covers the survey of scattered pre-emptions for 30 miles east, west, and north of Grand Forks, together with small areas of Crown land which have been under reserve for years, being parts of a large tract in this district which had originally been alienated as part of the land subsidy for the construction of the Columbia & Western Railway and now returned to the Crown by purchase. Only the portions of this latter which are adjacent to wagon-roads or trails were touched, and there are still large tracts which must be examined and reported on as to their agricultural, timber, and mineral possibilities before settlement can be encouraged or surveys made.

Following your instructions, a party was organized in the field with headquarters in Grand Forks, but as the work was very scattered no permanent means of transport could be arranged for, so advantage had to be taken of wagons, trucks, or motor-boats, as was convenient, and actual field-work was started in the early part of June on Morrissey Creek.

Morrissey Creek.

This stream is 4 miles east of Grand Forks, and though there is a large flow of water in the spring and fall, there is no storage system and the ranches in the valley holding the water record have to augment their supply for irrigation by electric pump from the Kettle River.

There is only a very limited area of vacant Crown land which is fit for agriculture, and this is at an elevation of from 2,200 to 2,500 feet and is timbered with pine, fir, and tamarack, of which only 80 acres was considered as milling-timber, the balance being suited for ties or cordwood. The few settlers already here are raising good crops of hay, grain, and roots without irrigation, and are getting employment and something towards the cost of clearing by selling cordwood in town, where the demand is good and the price high.

Sand Creek.

Across the summit to the north and accessible from Grand Forks by an old wagon-road and trail is the drainage-basin of Sand Creek and Snowball Creek (locally known as Halliday Creek), where there is quite an area of arable land, together with good summer range for a number of cattle, but as the road and trail was blocked by windfalls and there were no pack-horses available, the survey of this had to be left for the present.

Gilpin Creek.

Our next move was across the headwaters of McConnell or Dan O'Rea Creek (whose waters also should be stored for use in the dry season), our work being on the open range above Gilpin Creek. This range extends eastward to Cascade and is high and rocky, but the bunch-grass is abundant and at the present time is understocked. The bottom land here along the Kettle River has been settled for years and all the ranches have cattle on the range, while the orchards and fields show plainly the fertility of the soil when water is available, and if the present Government plan for an irrigation area is approved by the owners, many acres which are now only pasture will become as productive as any in the valley.

East of here is the settlement of Billings, where the Forest Mills have a large sawmill which obtains its logs chiefly from the upper waters of the Kettle River and the North Fork, from whence this year about 7,000,000 feet were driven for a distance of from 50 to 100 miles in two drives. Besides, there are logging camps on Moody Creek, about 6 miles from the mill, and also on branches of Sutherland Creek, but the latter limits were badly burnt by a forest fire this year, which raged in that valley during the early part of August.

The British Columbia Power and Construction Company also has an auxiliary station, generating power from the Cascade Falls on the Kettle River, which here breaks through a canyon, to be joined by the waters from Christina Lake before flowing south into American territory.

Deep Creek.

Our next move was by wagon to Deep Creek, and to reach there we had to cross into the United States and re-enter Canada 5 miles to the east, but this disadvantage will soon be eliminated, as the Works Department have already surveyed the right-of-way of a road from the foot of Christina Lake, following in a general way the Dewdney Trail, which was the pioneer trail of the Province, and doing away with some miles of sandy road on the American side which was in very bad condition when we used it.

The country here is high, reaching an altitude of 3,500 feet near the summit, but as wild feed is plentiful, and as the soil is clay and sub-irrigated from the surrounding hills, it raises splendid crops of clover, alfalfa, and timothy when cleared. The hillsides are timbered with spruce, fir, and cedar, making heavy clearing, but there is a small sawmill here which ships its lumber, together with ties and cedar poles, by wagon to the railroads at Cascade.

The settlers have gone in for dairying and send their cream twice a week to the creamery at Grand Forks. They have a school, but their post-office and supply-point is Cascade.

In 1896, at the height of the mining boom in Rossland District, there were many mineral claims staked in this area and considerable development-work done and good values obtained, but with the exception of a chrome-ore deposit near Cascade there has been nothing shipped, and this latter property has not been worked since 1918.

SUTHERLAND CREEK.

A splendid example of the work of the hardy settler was seen on our next move to the settlement on the high timbered country near the head of Sutherland Creek at what is locally known as Hill-top. This is reached by a steep but good wagon-road from Fife, a station on the Canadian Pacific Railway above Christina Lake, and the farms have literally been chopped out, and there is a prosperous community which finds employment all the year around, either on the land or in the woods, for the little siding of Fife has shipped many ties and cedar poles in the last ten years, and the camps are still operating, and each year sees larger clearings and more land brought under cultivation. They have their own school, but their post-office is at Fife, 3 miles away, and their nearest store at Cascade.

The arable land is very limited and has now been all taken up either by pre-emption or under timber licence, and the surrounding hills are rocky and have mostly been fire-swept. Higher up Sutherland Creek there is a considerable area of timber, chiefly spruce, fir, and cedar poles, and also one or two small areas of bottom land, but there is no road or even a trail, and no attempt has been made to take it up.

CHRISTINA LAKE.

During the month of July the weather had gradually been growing warmer, reaching 110° in the shade, and we were glad to move to Christina Lake, which is about 16 miles long, with an average width of three-quarters of a mile, and is at an altitude of 1,450 feet. It is surrounded by high hills rising from the water, and there is little agricultural land except at the mouths of the several creeks which flow through narrow valleys, where there is little bottom land, but some fair stands of pole and tie timber on the slopes.

McRae Creek is one of the largest of these streams and the wagon-road to Paulson follows its course, while the railway ascends to its headwaters before crossing to the slopes of Arrow Lake.

The arable land along the lake has been settled for some years and fine fruits and vegetables, including apples, plums, cherries, raspberries, strawberries, and tomatoes, were shipped from here this season.

The lake has become quite a favourite resort, and there are many summer cottages built along the shores and numerous visitors spend a few days trying for the elusive trout or black bass, with which the lake is stocked. Its beauties will be appreciated by many motorists upon the completion of the Inter-Provincial Highway, which will follow the shore-line for about 7 miles, and at the present time there is a fair motor-road for that distance, which continues up McRae Creek to the mining camp near Paulson.

This work completed our programme east of Grand Forks, and we moved by motor-truck back through Grand Forks and up through the Doukhobor Settlement on Fourth of July Creek to Eholt. This drive is one of the attractions of the country, and the magnificent orchards and farms extending from the valley to the hill-top make a wonderful picture and prove the fertility of the soil and the richness of the district.

EHOLT.

This village was in the past a busy junction-point on the railway, from which the mining camp of Phoenix was reached by a branch line, but now has relapsed into a deserted village, where only a few ranchers obtain their mail and supplies. It is at an elevation of 3,100 feet and the surrounding country is rolling, rising to a height of 6,000 feet on Roderick Dhu and Pelly Mountains on the north. The lower elevations are covered with a growth of scrub timber, from which many fir and tamarack ties have been cut, and wherever clearings have been made and water is obtainable the clay or silt raises fine hay, clover, and alfalfa, but its altitude and the prevalence of summer frosts makes grain-growing an uncertainty, but fine fall wheat was seen this year.

On the higher levels, where the timber-growth is more park-like or entirely absent, there is splendid summer range, and within 4 miles there are at least 1,000 acres of bunch-grass which are not grazed, though there is easy access by means of a good wagon-road, which was built to some mineral claims which have not been worked for years.

Continuing westward, the motor-road follows the valley of Eholt Creek through some splendid hay-ranches to Greenwood (2,450 feet), which is the centre of a rich mineral-belt and the supply-point for the adjoining ranching country.

North Fork of Kettle River.

Our fifteenth move and camp was about 12 miles north of Grand Forks on the North Fork of the Kettle River, which is about 60 miles long, but only the lower 20 miles has so far attracted many settlers. The bottom averages about three-quarters of a mile in width and was originally heavily timbered with spruce, cedar, tamarack, and pine, but this has all been logged off and now there are prosperous ranches on both sides, raising fruit, grain, roots, and hay, while the hills on each side provide limited range for a considerable number of cattle. The mountains rise to a height of about 1,000 feet on both sides, and in the valleys of the numerous small tributaries there are still good stands of timber, chiefly pine and tamarack, which on the upper slopes are quite open, affording good grazing.

There has been considerable mining development done in these hills, especially on Volcanic and Pathfinder Mountains, and work on the latter is continuing this winter.

The climate here varies from 15° below to 100°, and in the normal season the precipitation is sufficient for agriculture, but the continued dry seasons of the last three years have made irrigation necessary on all but the river-levels.

The settlement is easy of access, having a good motor-road on each side of the valley for the first 17 miles, besides having a semi-weekly train service for the same distance to the mine and mill of the Candy Mine, a fluorspar-deposit being operated by the Smelting Company of Trail. There are two schools in the lower valley, but the nearest post-office and supply-point is Grand Forks.

There is a sawmill at Lynch Creek and logging camps are working here and on the main river for about 10 miles above this point, but from here up the valley is hardly more than half a mile wide, and there is no land open for settlement until the timber has been logged off, but the soil in the bottom is silt or clay, capable of raising good crops, and there is considerable open range on the hillsides.

Beyond this point the wagon-road is built 30 miles to Franklin Creek and Gloucester mining camps, where this year the Government diamond-drill was operating, and if a sufficient body of ore is proven the railroad will no doubt be extended, as the surveys are already made.

The soil throughout the area examined this year varies from silt and sandy loam to heavy clay loam, with open subsoil of gravel and rock, though in some places there is a hard-pan or clay; also the need of irrigation varies with the altitude, for the precipitation is plentiful in the mountains, and at elevations of from 2,500 to 3,000 feet good crops are raised without it, while in the valleys, where the precipitation is hardly more than 18 inches annually, irrigation is a necessity.

I have, etc.,
Arthur H. Holland, B.C.L.S.

ARROW LAKES, KOOTENAY DISTRICT.

By H. H. B. Abbott.

Revelstoke, B.C., December 17th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—My programme of surveys for this season consisted of the survey of all unsurveyed pre-emption records in good standing in the vicinity of the Arrow Lakes and the survey of any vacant Crown lands found to be suitable for settlement. In regard to the latter, my attention was particularly directed to the possibility of finding suitable vacant lands in the two blocks of "railway lands" recently reverted to the Crown on the Lower Arrow Lake, and also at the head of Fire Valley and near the head of Kettle River, where some fourteen sections have reverted under the provisions of the "Soldiers' Homestead Act." Owing, however, to unforeseen delays in progress, due mainly to weather conditions and to the fact that lands suitable for settlement were found in the Whatshan Lakes neighbourhood which it was considered advisable

to survey on our way down the lakes, it was found to be impossible to make the surveys of the other vacant lands this season. A rough reconnaissance, however, was made of these several localities with a view to subsequent surveys, and separate reports are being submitted with regard to them.

As regards the pre-emptions surveyed this season, the outstanding feature has been the low standard of the land taken up during the last ten years in this district. The explanation of this is apparently to be found in the fact that the amount of agricultural land is comparatively small, and, climate and other conditions being very favourable, the locality was completely settled much earlier than other equally accessible parts of the Interior. For the most part, too, the good farms are still held by the original owners, and this has tended to keep the price of what land goes on the market much above real values, and there is a general keenness to get on the land throughout the locality. This is not confined to new-comers in the district, as several of the places surveyed this year were recent pre-emptions by men resident in the country for twenty-five and thirty years.

It is, however, likely that two or more large tracts held by syndicates and lying idle may soon revert to the Crown; if so, this and the gradual opening-up of logged-off lands will alleviate present conditions.

The general formation of this district is that of mountains rising immediately from the lake-shores and reaching an average summit of some 7,000 feet above sea-level in an average distance of 4 miles. These mountains are of general rocky formation, carrying little mineral and mostly second-growth timber; benches are infrequent and of small extent. With four exceptions, the tributary creeks do not carry valleys for more than 3 miles back from the lakes. The arable soil is mostly a brown sandy loam. Particularly on the Upper Arrow Lake the creeks mostly carry a considerable amount of timber, mainly cedar and hemlock.

ARROWHEAD.

Arrowhead, at the head of Upper Arrow Lake, is 28 miles south of Revelstoke and the terminal of a branch line of the Canadian Pacific Railway connecting with the main line at Revelstoke. It is also the head of navigation of the Canadian Pacific Railway steamship route on the Arrow Lakes, which operates between this point and West Robson, a run of 134 miles. There is also a daily mail and passenger service on the North-east Arm of Upper Arrow Lake between Arrowhead and Comaplix and Beaton, giving access to the Camborne and Trout Lake country. The Columbia River between Arrowhead and Revelstoke is navigable at high water for the larger lake-boats and at all times, except during the winter, for smaller draught. There is a Government road under construction between Arrowhead and Revelstoke, which when completed will give road communication between Arrowhead and the Central Interior; about 8 miles at each end have been constructed.

Arrowhead has a population of 200, with railway-station, Dominion Express office, post-office, branches of Imperial and Molsons Banks, school, hotel, and three stores. Two shingle-mills were operating all summer, with a daily cut of about 225,000, and employing thirty men in the mills and fifty men in the woods. There have been two large lumber-mills at Arrowhead, but the last one ceased operating nearly ten years ago and is partially dismantled. Most of the timber immediately tributary has been logged, but in the opinion of many lumbermen Arrowhead is the natural milling-site for the big tract of timber in the Big Bend of the Columbia River.

Columbia River Valley between Arrowhead and Revelstoke is wide and for the most part good agricultural land. It has been very heavily timbered, but is now pretty well all logged off or burned. The land is all privately owned, though only 25 per cent. of it is occupied, and again only a small percentage of this is cleared. Clearing in this valley costs above the average for the Province. Mixed farming is carried on profitably and a share of this product is tributary to Arrowhead.

NORTH-EAST ARM OF UPPER ARROW LAKE.

This arm, 9 miles in length, extends north-easterly from Arrowhead to the mouth of Fish Creek. The villages of Beaton and Comaplix are situated at the head. For nearly twenty years one of the largest and best-paying mills in the Interior operated at Comaplix, and this caused quite a little settlement here. The mill and two hotels burned down in 1914, and from then till this year Comaplix has been deserted. This year a small tie-mill has been working and there is a possibility of a shingle-mill starting.

Beaton, which is the old Thompson's Landing, has been the distributing-point for the Trout Lake, Ferguson, and Camborne mining camps. It has a fluctuating population, but present population is about sixty. It has a post-office, school, two stores, and hotel, and daily service with Arrowhead, Camborne, and Trout Lake. The lower part of Fish Creek Valley contains about 1,000 acres of really first-class agricultural lands, all privately owned. A car-load of potatoes is exported annually. Fish Creek has been logged as far as the Railway Belt boundary, but above this point contains a fine stand of timber.

Galena Bay.

Galena Bay, on the east side of Upper Arrow Lake, immediately below the North-east Arm, has been the scene of extensive logging operations since 1892. Some of the logged-off lands are now being cleared and it is becoming a thriving farming settlement. It has its own school, but otherwise is dependent on Arrowhead, with which it has a daily launch service. There is likelihood of more logged-off lands here being available for settlement in the near future.

Halcyon and St. Leon.

Both these places have long been known as health resorts, and medical men seem to consider these sulphur springs superior to any other in the Province. At both places there is a hotel and fully equipped baths, and at St. Leon many families spend much of the summer camping on the beach.

Pingston Creek.

A lumber-mill has operated at Pingston Creek intermittently for the past fifteen years. Till this fall the mill was owned by the Revelstoke Lumber Company, which cut close on 4,000,000 feet of lumber this summer and employed thirty-three men.

Fosthall Creek.

There is a small farming community at Fosthall Creek and a considerable amount of good agricultural land. This is held privately and mostly by non-residents and very little of it is cultivated.

Nakusp.

Nakusp, the principal town on Arrow Lakes, has population of 700 inside a 3-mile radius. It is the terminal of the Canadian Pacific Railway branch line between the Arrow Lakes, Slocan Lake, and Kootenay Lake. During the winter it is the foot of navigation on the Arrow Lakes and traffic between Revelstoke and the Nelson boundary and Crowsnest country is routed through by Nakusp and Slocan Lake instead of via West Robson.

Nakusp has a Provincial Government office, Dominion Express office, post-office, hospital, drug-store, branch of the Canadian Bank of Commerce, two hotels, and six stores, and is also the headquarters of the Government telephone service on Arrow Lakes. The Nakusp Lumber Company's sawmill has been working double shift from the middle of March till the end of September and shipped 111 cars of lumber and twenty-three cars of ties. Last year it shipped 203 car-loads. The mill employs fifty men and has kept two logging camps in the woods all year. There is also an extensive shingle and pole business done in this neighbourhood and approximately 3,000,000 shingles and 100,000 poles have been shipped during the year. The neighbourhood of Wilson Lake and the upper part of Kuskanax Valley contains large stands of cedar, hemlock, and fir timber of good quality, and as yet no attempt at logging these tracts has been made. The Lower Kuskanax Valley has been timbered, but most of it has been logged. The soil here is of a sandy nature and does well for any hardy varieties of fruit. Irrigation is very little practised, but water can be comparatively easily put on this valley and on the benches behind the town and the production thereby increased. This land is all divided into holdings of 10 to 20 acres, but the majority of these are lying idle or practically so. Many of the settlers are content with small gardens and depend on work locally in the mills, camps, or on Government roads, rather than make any determined attempt to make their holdings self-supporting. In the exceptional cases where they have given all their attention to the land it has been a very uphill struggle, but where, as in the case of J. H. Stevenson, there has been optimistic perseverance these places are now well repaying the effort and stand intensive farming methods of cultivation. In the neighbourhood of Brouse and the Nakusp Creek Valley the soil is mostly a rich clay loam and there are several first-class farms here which are on a good paying basis.

Apart from supplying local demands, there is a steadily increasing shipment of dairy produce to Revelstoke and Nelson, and last year five cars of beef went out of this district. The apple-crop this year suffered as elsewhere in the Province, and while there is a steady increase in the number of bearing orchards, the crop was only 60 per cent. of what it would have been had the year been normal. The 1919 shipment was 50,000 boxes and this year's was probably a little over 40,000. Complaints have been general as regards non-facilities for shipping, and small fruits seem especially to have suffered therefrom. Poultry are raised extensively and, in spite of high cost of feed, profitably. The most of the pre-emptors in the locality depend upon trapping as much as, and in many cases more than, anything else for their means of livelihood. The past two winters, with the extraordinary high price of fur, gave this a tremendous impetus, but the result is that the district is now practically trapped out, and with the market very unsettled few trappers are going out this winter.

Surveys of a water system to supply Nakusp and neighbourhood were completed this year, and the system, largely financed by Government aid, will be installed next year, as will also an electric-lighting system. Only a limited number of Nakusp town lots were originally sold and since then the balance were withheld from sale. This year they have been reopened for sale and thirty lots and two complete blocks were sold at a relatively low figure. There has been a steady increase of settlers coming in, mainly from Prairie points, and a consequent large demand for land already cleared. Cleared land has been selling at all the way from $200 to $500 an acre and uncleared about $100.

Nakusp has a comparatively equable temperature, with a snowfall of about the average for this elevation in the Kootenay. During the last twenty years the lowest winter temperature was 16° below zero, for one night only. Normally the temperature only goes below zero three or four nights each winter.

WEST DEMARS.

This is a farming settlement of some fifty population, situated on the Columbia River immediately below the foot of Lower Arrow Lake. Between this and Arrow Park the mountains come down to within from half a mile to a mile of the river and on the south side in places to within a quarter of a mile. While the north side is better adapted to farming, the best farm in this locality is that situated at Rock Island, on the south side of the Columbia, where Louis Borgat, as a result of years of hard work, has brought some 80 acres under cultivation. The north side of the river is all logged-off lands and much of it can be cleared at much below average cost; but little clearing has been done here since the first few years of settlement. The soil here is for the most part clay and good sandy loam to a considerable depth and is well adapted to either fruit or general-farming purposes.

ARROW PARK.

West Arrow Park is a settlement of 175 population at the mouth of the Mosquito Creek Valley. There is a post-office, general store, school, and hotel here. Settlement is at present confined to a radius of 1½ miles, as the main valley of Mosquito Creek is entirely covered with timber licences. Although forest fires are continually making appreciable inroads on this timber, there is a fine stretch particularly of virgin cedar and spruce throughout this valley. As compared to most creeks in the Interior, this is a very wide and long valley, extending as it does almost into the valley of Fosthall Creek, and there will be a considerable acreage available for settlement after the timber has been taken off. In view of the quality of this timber and its accessibility it is to be wondered that it has not been already logged off. One berth near the mouth of the valley has been completely logged off this year and will shortly be available for settlement.

Across the Columbia from West Arrow Park is the settlement of East Arrow Park, the centre of a small and thriving farming community. There is a post-office, farmers' co-operative store, school, and church here. An almost continuous chain of farms stretches from above East Arrow Park to Burton, and this is about the best farming land on the lakes.

BURTON.

Burton Townsite is ideally situated at the mouth of Cariboo Creek and on the swiftest part of the Columbia between the two Arrow Lakes. It has a population of about 200 inside the school district, with three schools, church, post-office, hotel, and two stores. Having started as

a mining camp, it has gradually become a farming settlement and there are from thirty to forty families living on farms in the immediate vicinity. Three of these farms are of 320 acres each and the remainder are from 20 to 160 acres. About six or eight car-loads of fruit are shipped from here annually and the area coming under crop is steadily increasing. Last year four car-loads of cattle were shipped out.

About 1894 there was a stampede on Cariboo and the adjoining creeks, and Mineral City, 7 miles up Cariboo Creek, came on the map, as did so many other "cities" in the Kootenay during this time, but building did not go beyond one frame hotel, long since burned down. There are at present some half a dozen good silver-lead prospects in this vicinity. H. E. Forster has been doing good work on the Millie Mack, which is a high-grade silver-lead proposition running high in silver values and sometimes as high as 3 oz. in gold. During the past four years he has been shipping about a car-load of ore annually and this year is shipping some 10 to 12 tons. Other properties which are being worked are the Chieftain and the Canadensis on Cariboo Creek and the Tillicum on Canyon Creek.

Whatshan Lakes.

On the east side of Upper Whatshan Lake is a bench 300 to 500 feet above the lake-level, with a general sandy loam soil, alternating with clay bottom land and outcropping rock and gravel. We found 585 acres of unsurveyed vacant land on this bench, most of which had at one time been covered by pre-emption records which were abandoned for lack of transportation. We surveyed this vacant land into eight lots of a maximum area of 80 acres. Some of the adjoining land which is under cultivation shows good results in fruit and vegetables, particularly potatoes. The ground is comparatively open and clearing is much easier than in other parts of this district. The great handicap has been the absence of any access by road, but there was a good location made for a wagon-road from the Arrow Lakes to Upper Whatshan Lake eleven years ago, and this location either passes through or close by all these new surveys. In the interests of the settlers already in this vicinity and of prospective settlers on these lands, it is to be hoped that the construction of this wagon-road will be commenced as soon as possible. There is also a considerable area of good agricultural land immediately about both Whatshan Lakes that is held under private ownership, but is unoccupied.

The Needles and Fauquier.

The Needles, with a population of about 100, is at the mouth of Whatshan River, and Fauquier, with a population of seventy-five, is on the east side of the Narrows, directly opposite the Needles. Both are small fruit-growing settlements and each has its own school, post-office, and general store. The amount of arable land at either place is somewhat limited, but some twelve cars of fruit are shipped annually from these points. Captain Forslund has a good farm half-way between the Needles and Edgewood and ships a considerable quantity of fruit, as well as supplying the Canadian Pacific Railway lake-boats.

Edgewood.

Edgewood is a relatively new town, replacing the old townsite of Killarney, and is situated on the west side of Lower Arrow Lake at the mouth of Fire Valley. It has a beautiful site and many prettily laid-out homes, somewhat on the pattern of Victoria. It has a population of 300, with post-office, Dominion Express office, hotel, church, school, general store, and drug-store. This year there are three camps in the vicinity taking out poles, but otherwise fruit-growing and mixed farming are the main industries. Edgewood is the natural outlet and supply-point for Fire Valley and the Wauchope country.

Fire Valley, Wauchope, and the Kettle River.

Fire Valley is a wide valley on the Inonoaklin River and at the lower end carries mostly deep black loam soil which is very well adapted for dairy and mixed farming. Some twenty farms of varying size are at present being worked, but there is still a large area of land privately owned and lying idle. The climate in this valley is much milder than elsewhere in the district, and it is only a matter of time till the valley becomes a heavy producer. This good land, all of which is privately owned, stretches some 9 miles up the valley, after which the soil becomes sandy, and farther up very dry and gravelly. About 14 miles up the mountains close in on the

river and there is very little valley or bench till about 23 miles up. From here to Wauchope, about 26 miles from the Arrow Lakes, there are scattered beaver-ponds and meadows which can apparently be easily drained and covering an area of some 400 acres. This is all unsurveyed vacant Crown lands. Wauchope had a very short-lived mining boom in the nineties. A sample from John Lodge's claims on the creek which enters the Inonoaklin at this point was returned with an assay of tellurium and started a stampede. Working under considerable difficulty, a car-load of this ore was rushed over the old trail some 60 miles to Vernon before the result of a check assay arrived, showing nothing but iron values. The ore was used to grade a length of street in Vernon, and to-day the cabin which marks Wauchope is visited only by hunters and trappers.

From Wauchope to the head of the Inonoaklin, and thence down Slow Creek to within a mile of its entering the Kettle River, there is a chain of wild hay meadows and beaver-ponds, averaging nearly a mile in width and 7 miles in length, all of which, except 160 acres, is vacant land. This land can be drained naturally by blowing out the beaver-dams, which are more numerous here than I have ever seen them, and in the matter of clearing there are only these dams and willow-brush to contend with. There are similar wild hay meadows and beaver-ponds on the Kettle River, both above and below which is known as the Kettle River Bar. On the Kettle particularly there is a considerable extent of bench land, but this is a dry, gravelly soil covered with second-growth pack-pine, and, in my estimation, it has no agricultural or horticultural value. All of this section of country lies at an elevation of 4,000 feet above sea-level, which practically limits it to hay-growing and stock-raising propositions. According to my estimate, a system of survey along these valleys, taking in the minimum of barren land, would embrace an area of approximately 4,500 acres.

On the summits on the south-west side of Fire Valley and about 10 miles from the Arrow Lakes there is a large plateau known as Glen Paige, consisting of the finest open pasture land and supposed to cover several thousand acres. Opinions vary greatly as to its elevation, but as near as I can find it is not more than 5,000 feet above sea-level. The settlers in the lower valley generally consider the prospects are favourable for combining the advantage of this summer range with the hay-growing possibilities of the vacant meadows above Wauchope to develop a profitable stock-raising industry.

In the vicinity of Wauchope and the Kettle River there has been more or less mining activity since the sixties, when this country was comparatively well prospected. At that time considerable placering was done on the two creeks north of Wauchope and on the Kettle River from the bar up. Later, particularly around the bar, a good deal of gold was taken out by some Chinamen, and about 6 miles above the bar a man called Marsh has been placer-mining for the last forty years.

On the mountain north-west of Wauchope Mr. Paige and the Olds Bros. have a good free-milling gold proposition, and south-west of Wauchope and at the head of the East Fork of the main Kettle River is the Lightning Peak country, containing at present nineteen claims. These are principally silver-lead properties with high silver values, but also show gold and copper. This summer the principal work was on the Waterloo, where G. A. Rendell took out some 10 tons of high-grade ore by pack-train. On the Lightning Peak Group, though nothing was done this year, a 60-foot shaft and 280 feet of tunnel have been driven and some three or four car-loads of ore shipped. More or less development has been done of late years on the other groups, but A. H. Green has this year made a road-location from the Lightning Peak to the proposed Vernon–Edgewood Road, and the construction of these roads will give this camp a big impetus.

ROADS.

The Vernon–Monashee Road was extended to the Kettle River by interned alien labour during the war, and this summer A. H. Green, B.C.L.S., located the gap between the Kettle River and the end of the present Fire Valley Road, some 9 miles from Edgewood. Construction was not commenced on this till late in the year, but close on 2 miles of road was completed. It is probable that this gap will be completed about 1922. This will connect at Edgewood with the existing road from here to the Needles.

A ferry service will likely soon connect across the Narrows here with the end of the existing road at Fauquier, which joins Fauquier, Burton, and Nakusp. This is a fair automobile-road between Burton and Nakusp, but is at present in poor condition between Fauquier and Burton.

There is at present a road from Nakusp to the head of Slocan Lake, and construction has been going on or is contemplated on several short gaps to make this continuous to Nelson. The prospects, therefore, are that two or three years will see a continuous highway between Vernon and Nelson, passing through some 70 per cent. of the agricultural localities of this district.

As already mentioned, Arrowhead will shortly be connected by highway with the Central Interior, but it will be many years before there will be anything to justify the heavy cost of construction to extend this down the lakes.

Paralleling the main road between Fauquier and Nakusp are several stretches of road constructed on the west side of the lakes. There is some 3 miles of road north from the Needles, and it is contemplated continuing this road another 5 miles to Oatscott (Christie's) Landing, the starting-point of the road located into Whatshan Lakes. From here to the end of the existing road from West Arrow Park and Graham's Landing is about 9 miles, and the cost of construction would be too great to justify this extension for some time. The Graham's Landing–Arrow Park Road is built for 7 miles and there is again a gap of 5 miles to meet the road from West Demars. The cost of construction of this gap would be relatively low, and as it would pass through good farming iand it is to be hoped this road will be carried through.

Dominion Government Telephone Service.

With headquarters at Nakusp, this telephone service links up all points from Nakusp south and also connects with Nelson.

Game.

This is a fairly good game country. The lower part of Fish Creek Valley has perhaps the finest black bear in the Province, and farther up and throughout the high summits above Camborne is ideal ground for silver-tip, sheep, and goat. All down the lakes black bear are fairly numerous, and silver-tip can be found on the higher ranges, particularly about the Whatshan Lakes and Fire Valley. About 3 miles down the lake from Burton is some good goat country, but difficult of access; goat are also fairly plentiful around Upper Whatshan Lake, the Upper Whatshan River, and Barnes Creek. Deer are remarkably thick in Fire Valley and surrounding country and fairly numerous around Whatshan Lakes; but they are also to be found anywhere along the lakes. No moose have been seen in this district for nearly twenty years and caribou are very scarce. Most species of duck are to be found, but they are far from plentiful. Geese are even less common. Grouse are fairly numerous.

As to fishing, the Whatshan Lakes are equal to the best lakes in the Province for all kinds of trout and also char, and are larger and more easy of access than most of the good lakes, there being an automobile-road from the Needles to the foot of the Lower Whatshan. Most of the larger creeks are well stocked with trout and trolling is fairly good on the main lakes; this fall remarkable success was achieved with the fly on the Lower Arrow Lake.

I have, etc.,

H. H. B. Abbott, B.C.L.S.

SLOCAN VALLEY AND SOUTH-WESTERN KOOTENAY DISTRICT.

By W. J. H. Holmes.

Victoria, B.C., November 12th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report upon my work of the season 1920:—

My surveys this year were located throughout the valley of Slocan Lake and Slocan River and near the headwaters of Big Sheep Creek in the vicinity of Paulson, on the Kettle Valley branch of the Canadian Pacific Railway, all in West Kootenay District, and consisted of the survey of unsurveyed pre-emptions that were located prior to the amendment to the "Land Act" restricting pre-emptors to surveyed lands, and also of any unsurveyed Crown lands that I might discover in these localities and which would be suitable for settlement.

I commenced operations by surveying two pre-emptions—one immediately east of the town of New Denver and the second about 4 miles south of the town of Silverton, on Slocan Lake—after which I moved to Wilson Creek, on which I surveyed two pre-emptions and two pieces of vacant Crown land totalling 640 acres.

Wilson Creek is the largest stream flowing into Slocan Lake and is about 100 feet wide and 8 feet deep at the mouth, with a current 8 to 10 miles per hour when in flood and which at the time of low water falls to 1 to 2 feet deep. On looking at the map it will be noted that the creek takes its rise in several tributaries in the range of mountains along the southern border of the watershed of Lardeau Lake and River and flows almost south, entering Slocan Lake near its north end at the town of Rosebery, or about 3½ miles north of the town of New Denver. It is a typical mountain stream, the mountains for the most part sloping steeply down to the water's edge; for the first 8 or 10 miles or more from the mouth there is little or no width to the valley-bottom. The valley at one time was heavily timbered with cedar and fir ranging up to 4 feet in diameter and even more, interspersed with hemlock. As you ascend the mountain-sides the timber is lighter, and you also find tamarack, spruce, and pine to 2 feet in diameter. Periodical fires have destroyed much of this valuable timber, but much still remains.

The land I surveyed is on a bench on the west side of the creek about 7 miles from the mouth and is some of the best I have seen in the district. This bench varies in width up to three-quarters of a mile, is about 2 miles long, and slopes gently to the east, falling 1 to 4 feet in 100. Soil is a light sandy loam about 10 inches deep, the sub-soil being a blue clay under most of the surface and sand and fine gravel under the remainder. Nearly all the ground-surface is entirely free of stones, even small ones.

The elevation of this bench is about 500 feet above the main creek-bed, or 1,150 feet above Slocan Lake or 2,915 feet above sea-level. Ample water for irrigation purposes is provided by a stream flowing across the bench, carrying about 1,500 to 2,000 gallons per minute at the time of my visit in June, and there are many springs and small streams along the mountain-sides above, but which sink and so disappear as soon as they reach the bench-level. There are probably other benches suitable for agricultural purposes farther up the creek, but the whole seems to be covered and held by timber licences.

A good trail leads up Wilson Creek from Rosebery for several miles, used principally by the owners of the pre-emptions I surveyed and by prospectors, hunters, timber-cruisers, fire wardens, etc.; I, however, doubt if horses can be taken over this trail higher than about 8 miles because of lack of bridges. A wagon-road up the creek could be built at a reasonable cost, as any large amount of rock-work would not be involved. The Canadian Pacific Railway provides a daily passenger and freight service each way between Slocan City at the south end of Slocan Lake and Rosebery, the steamer calling at all way-points on the lake and at any point desired. The Kaslo–Nakusp branch of the Canadian Pacific Railway provides a tri-weekly passenger service each way between Kaslo and Nakusp, meeting the boat at Rosebery and transferring passengers to or from Nelson and way-points to the south, to or from Nakusp and Revelstoke and way-points on the Arrow Lakes to the north, and to or from Sandon and Kaslo and way-points to the east. A daily train service is provided by the Canadian Pacific Railway up the valley of the Slocan River between Nelson and Slocan City, connecting with the steamer on Slocan Lake.

On June 23rd I moved south to Slocan City and proceeded to survey two pre-emptions adjoining the town, after which I moved over to the west up Goat Creek and surveyed another pre-emption.

The valley of Goat Creek is a narrow gash in the mountains which rise precipitously on each side. While there may be a few acres of agricultural Crown lands remaining in the valley, I saw none of sufficient extent to justify a survey. Most of the remainder of the valley is held by timber licence, and a small mill is in operation about 2½ miles up the creek, the sawn lumber being sent down by flume to a loading-point near Slocan River. There is a fair wagon-road up Goat Creek as far as the sawmill.

On July 9th I moved by train from Slocan City south to Perry Siding and proceeded to survey three pre-emptions on the west side of the river and a fourth about 2½ miles south of Perry, near a settlement called Appledale. This part of Slocan Valley, including Perry and Appledale, is fairly well settled and under cultivation, although considerable areas of good land still remain to be cleared up. The valley here is 1½ to 2 miles wide, with excellent land for production of grains, most kinds of fruit, and garden produce. In winter the climate is mild,

while in summer July and August are usually hot (sometimes 100° F. or more in the shade), with occasional thunder-storms. Altitude is 1,730 feet above sea-level. There is a general store and post-office and school at Perry and the same at Appledale.

There is a good wagon-road throughout the whole length of the valley on the east side, with good bridge crossings at all important points, such as Slocan City, Perry, Appledale, Passmore, Crescent Valley, etc., with unconnected stretches of road from the bridges north or south as required by settlers on the west side. Motor-cars are often on the road between Nelson and Slocan City.

It is my opinion that no unalienated Crown lands suitable for agricultural purposes remain in the locality, or indeed in any part of Slocan Valley, including Slocan Lake, unless there be a few acres here or there back against the mountains or at much higher levels.

After completing my work at Appledale I moved south to Passmore and surveyed another pre-emption. This is a flag-station on the Slocan Valley branch of the Canadian Pacific Railway. The valley is narrower here, but contains some excellent farm land, much of which is under cultivation.

At Koch Siding, about 2 miles south of Passmore, a small sawmill is in operation, turning out two to three car-loads of lumber a day.

On August 5th I moved by train to Crescent Valley for the purpose of surveying a pre-emption about 3 miles north on the west side of the Slocan River and two others about 3 miles west up Goose Creek. Crescent Valley is a thriving little settlement with a good general store, post-office, church, school, etc. It is on the main highway between Rossland, Trail, and Nelson, which road crosses the Columbia River by ferry near Castlegar; thence follows up Pass Creek for about 6 miles and swinging to the east follows down Goose Creek and crosses the Slocan River at Crescent Valley; thence along the Kootenay River past Bonnington Falls to Nelson. The soil in the vicinity of Crescent Valley is a light sandy loam and wherever water can be got on to the land is highly productive. There are, however, several thousand acres of excellent land in the vicinity lying idle because of the lack of water. The Doukhobors are large land-owners in the valley of Goose Creek and are putting in an irrigation pumping plant, but installation was not completed at the time of my visit.

I then moved by wagon to near Bonnington Falls, where I surveyed two pre-emptions against the mountain north of the wagon-road. Practically all land suitable for agriculture in this vicinity appears to have long since been taken up; much has been cleared and put under cultivation, principally fruit, apples, cherries, strawberries, etc., but several thousand acres still remain on which nothing has been done. The main cry seems to be for water, to supply which an irrigation system of some extent would be required, as the streams shown on the map as flowing south into the Kootenay River are in most cases practically dry during the hot weather in July and August.

On August 27th I moved my party to Farron, on the Kettle Valley line of the Canadian Pacific Railway, and there surveyed another pre-emption. Farron consists only of a roundhouse and telegraph-station at the summit of the pass between Arrow Lakes and the Columbia River on the north-east and the valley of the Kettle River on the south-west. The altitude of the pass is 3,984 feet above sea-level and the mountains on either side are steep and rocky and mostly bare of timber, which has been burnt off. I saw no land in the vicinity suitable for agriculture.

My next move took me 4 miles south of Farron to the head of Hamlin Creek, east of Paulson Station, on the divide leading easterly to the headwaters of Big Sheep Creek. At Paulson there is only a hotel with general store and post-office on the ground floor and very comfortable rooms and good board are provided for travellers. There is a fairly good wagon-road between Cascade and Paulson, and this road continues up Hamlin Creek to the Inland Empire Mine. Motor-cars frequently go up this road to the mine with hunters or parties to pick huckleberries, which grow in abundance on the mountain-slopes in the vicinity of the mine.

Several timber licences straddle the divide, but are now practically logged off, the timber having been sawn at a mill which was located near the head of Hamlin Creek, but now entirely dismantled and the machinery removed. There are about 2,500 or more acres of very excellent agricultural land on this divide, although high, its altitude being about 4,500 feet above sea-level.

After surveying three pre-emptions at the head of Hamlin Creek I moved eastward about 3 miles by road to a small tributary of Big Sheep Creek and there surveyed two other pre-emptions. I cruised the upper valley of Big Sheep Creek as far as Sheep Lake, and found an

attractive valley almost level for nearly 6 miles and varying in width to over half a mile. There are numerous grass meadows, one being nearly half a mile wide and a mile long, between which are stretches of open pine and spruce 6 to 10 inches in size. The mountains on either side slope more or less gently away, and while many fires have run over the hills, are in places still covered with pine and spruce up to 12 inches in diameter and some cedar. Before the fires the timber was in places as large as 3 and 4 feet in diameter on the mountain-sides. I estimated there were over 2,000 acres of flat bottom lands, while much of the land on the mountain-slopes would provide good range for cattle. Sheep Lake empties into Blueberry Creek, which flows easterly, the divide between it and the head of Big Sheep Creek being about 2 miles west of Sheep Lake. Altitude of Sheep Lake, 4,120 feet; that of the divide west of Sheep Lake, 4,290 feet; and of Meadow Lake, at the head of Big Sheep Creek, 4,250 feet. From Meadow Lake down, the valley of Big Sheep Creek falls about 150 feet in 3 miles, beyond which it falls more rapidly and soon enters a narrow deep valley, the mountains rising abruptly on each side.

An old trail from Cascade to Rossland runs through the upper valley of Big Sheep Creek, but the bridges all need renewal. A wagon-road could be built into the valley with little trouble and at no great expense by improving the rough road which runs from near the old sawmill at the head of Hamlin Creek to Michener's place, which is one of the pre-emptions I surveyed as Lot 12809, and then extending this road eastward.

Deer are numerous and I saw signs of caribou. Black bear are numerous also, and grizzly and silver-tip are to be found on the higher mountains. There are some mink and marten, though I am told they are rapidly becoming scarcer. Grouse are plentiful and also rabbits. Of course, as is usual in such places, coyotes are numerous and much in evidence after nightfall.

The lateness of the season and bad weather made it advisable for me to bring my party in instead of proceeding with any further surveys this year, although, as I have indicated, there are several thousand acres that should be surveyed in the locality last mentioned.

I have, etc.,

W. J. H. HOLMES, B.C.L.S.

VICINITY OF KOOTENAY LAKE.

BY H. D. DAWSON.

KASLO, B.C., January 26th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on that portion of Kootenay Lake District extending from the West Arm of Kootenay Lake in the south to Poplar, on the Lardeau River, and Morgan Creek, a tributary of Duncan River, in the north, in connection with my surveys of pre-emptions, Government lots, and ties during the 1920 season:—

This is a portion of what is geologically known as the Purcell Trench and was probably formed by tremendous and long-sustained glacial action. On the east is the vast mass of the Purcell Range, extending for over 100 miles north and south and 30 miles wide, forming an immense table-land of alpine peaks and ice-fields varying from 7,500 to 10,000 feet above sea-level and forming an almost impenetrable barrier between this valley and that of the East Kootenay. On the west is the Selkirk Range, not quite so high and not so extensive, being cut by several deep cross-trenches, such as the West Arm of Kootenay Lake Trench; the Kaslo River Trench, through which the Kaslo and Slocan branch of the Canadian Pacific Railway runs through to the Slocan Lake and then on to the Upper Arrow Lake; and in the north is the Lardeau River and Trout Lake Trench running through to the North Arm of the Upper Arrow Lake.

In the bottom of this main Purcell Trench lies the Kootenay Lake at an elevation of 1,760 feet above sea-level, the lower reaches of the Lardeau River, and the Duncan River and Howser Lake.

The precipitous slopes of the mountains generaly rise direct from the level of the lake, or with sometimes small benches close to the lake. The summits, being so close, necessarily cause the creeks to be very short and swift and not of big volume. Most of them emanate from snow-fields and glaciers and emerge into the lake from between deep and precipitous canyons with many falls. Trails run up most of these steep sides and hanging valleys with many switchbacks,

but unless they are serving prospectors actively engaged in their work the trails are little used and quickly become impassable owing to slides, fallen logs, wash-outs, etc.

Both the Lardeau and Duncan Rivers are good-sized streams. The waters of the former, in addition to being "filtered" by Trout Lake, are in themselves clear and the fall is very rapid. In the 32 miles from Trout Lake to the Kootenay Lake there is a fall of 650 feet. The river is therefore scarcely navigable, although its bed is well scoured out. Fishing is fairly good—salmon, trout, and in the late season abundance of redfish. The Duncan and its tributaries, on the other hand, nearly all have their sources in huge glacial fields and their waters are thick and muddy, so that there are no fish. The fall of the main river is not nearly so great and in consequence mud and sand bars abound. During the spring and summer the river is navigable as far as Healey's Landing, about 20 miles up from Howser, but during the fall and winter the water is too low to permit this.

The amount of agricultural land in the district is very small. There are no extensive areas of flat or gently sloping land fit for settlement, and what there is has mostly been taken up during the thirty years that the district has been settled, dating back to the time when the numerous high-grade silver-lead ores of the Ainsworth and Slocan and to a lesser degree the Lardeau and Duncan River Districts were first discovered.

The chief areas where there are a few hundred acres of agricultural land are as follows: Queen's Bay, Mirror Lake, Kaslo City, and Shutty's Bench on the west side, and Crawford Bay, Riondel, Johnson's Landing, and Argenta on the east side of the lake, the flat lands lying at the mouth of the Lardeau River both above and below its junction with the Duncan River, along the southerly shores of Howser Lake, and narrow strips along each of the rivers.

There are many thousands of acres—said by some to amount to as much as 7,000—lying along the Duncan River and between Howser and Kootenay Lakes which are flooded during the summer months owing to waters from the spring freshets being unable to escape from Kootenay Lake quickly enough, and so backing up. It is believed these lands would be very first-class agricultural lands if steps were taken to keep them from being flooded, for they are composed of mud and silt eroded from the limestone mountains by the great ice-fields. They are covered at present by very rank growths of reeds and marsh-grasses.

The flooding of these lands during the hot season affords opportunities for enormous swarms of mosquitoes, which during June, July, and early August make life in the vicinity almost unbearable, and cattle and horses must be driven to the benches from 500 to 1,000 feet up the mountains in order to escape the pests.

The lands at the mouths of the side-creeks entering Kootenay Lake are unsuited for agriculture. Their areas are not large and are mostly covered or formed by glacial drift and boulders. There is no soil and the growth at present on them is scrub brush eking out a bare existence on the barren gravel-deposits.

With one exception, all the pre-emptions and Government lots I surveyed are situated contiguous to one or other of the above-mentioned settlements, that exception being Lot 12834, situated close to Lockhart Beach on the east shore of the lake. Along the shores here, however, there are at intervals settlers who can be reached by boat or trail.

Of the six pre-emptions included in my instructions, I surveyed five, the sixth never having been in occupation, having no improvements on it and being quite unfit for settlement. The area consisted partly of almost inaccessible mountain-side to the west of the Duncan River and of land flooded during the entire summer every year on the east of the river. There are, however, narrow "shells" of land along each bank of the river on which grow very excellent cedar up to 72 inches diameter and splendid birch up to 36 inches diameter. The value of this timber probably constituted the real object of pre-empting the land, possibly combined with the hope that at some future time means might be taken to prevent the annual flooding, when that portion east of the river would become a very fine piece of land especially adapted for grazing and those crops which would not suffer from late summer frosts.

Of the five pre-emptions surveyed, one is in actual occupation by the pre-emptor and his family, and he now has a very nice self-supporting ranch. One is in partial occupation by a bachelor who spends a good deal of his time trapping in the winter and occasionally fire-fighting in the summer; one is used for grazing purposes; and two are unoccupied, but have had some work done on them, and, if judgment and faith are used, present possibilities for the future.

Of the three Government lots surveyed, Lot 12820 at Argenta and Lot 12834 near Lockhart Beach present opportunities for profitable mixed ranching on a small scale, and Lot 12833 bordering the lake between Queen's Bay and Coffee Creek has a few acres on the bench that could be made into a small ranch.

Of the six ties required, one—viz., from Lot 9292 to Lot 197 near Lockhart Beach—I incorporated in with the survey of Lot 12834, but in no other case is there any land suitable for agriculture or settlement. Four of the ties were along the wildest parts of the lake-shores, with precipitous cliffs rising shear out of the water to heights of from 500 to 1,000 feet. In two cases the lowest altitudes at which it is possible to safely pass over are over 1,000 feet above the lake-level, and in another 550 feet. An old post to which we were required to tie on to is situated at an elevation of 1,080 feet above the lake, this being the nearest point on the line that the former surveyors could get to the lake.

In the case of three of the very old surveys—viz., Lots 185, 187 (in which I tied in the astronomical pier) and 197, to all of which ties were required—not a single old post nor evidences of corners could be found. The corners in one case were assumed by comparing the shore outline with the copy of original field-notes, and also in the other two cases, but aided by certain very doubtful evidences. Forest fires and floods appear to be the chief destroying agents in destroying traces of these old surveys, but even then their work could not have been so thorough if the practice of building substantial stone cairns had been carried out. It might be well, too, if contractors, etc., putting through roads, railway-grades, etc., should be made to exercise more care when finding it necessary to move corner posts.

This district is in the Interior "Wet Belt" and the climate is consequently milder than in many other parts. The precipitation amounts to an average of 30 inches annually, of which about one-quarter to one-third is snow. Even in January the temperature seldom falls below zero, and for weeks during the winters the thermometer readings will hover between 25° to 35° F. Rain wil often fall during these periods. The warm summer weather will usually set in during June, and from then on during July and early part of August temperatures of 90° or 92° F. may be experienced during the heat of the day, but by 4 or 5 o'clock cool breezes from the mountains will so lower the temperature that throughout the year it will be necessary to use blankets for sleeping. During this period there are usually frequent electric storms and heavy rain-storms, which always cool the air for a day or so. These electric storms are, however, dangerous, for they frequently start up forest fires, which sometimes assume large proportions before burning themselves out or being got under control. Frosts may be expected in September, especially in the northern part, and snow-flurries in October and November, but the snow will not usually stay on the ground until near Christmas and then will last until March. Generally no continued spell of cold weather will be experienced until the ground is well protected by snow, although in such a mountainous country there are always exceptions and variations, and against these one should always be on the watch.

The chief agricultural products are the fruits, of which the apples and cherries take first place. The district produces some of the finest cherries I have ever seen, and the apples compare very favourably with those from other better-known and larger districts. Pears, plums, berries, etc., do well, but the climate is not suitable for peaches or apricots. On the deeper soils most root-crops are successful. Where possible the settler should endeavour to raise at least a few head of stock, not only for the profit in themselves, but for the enrichment of his soil. He will be able to raise all or nearly all their winter feed. There is very little, if any, grain grown.

The many small prospecting and mining camps and logging outfits will buy produce in small quantities, and in larger quantities fruit by the car-load may be shipped to the Prairies. At present this is mostly done by way of Lethbridge, Alta., as a distributing-point. The berries are somewhat at a disadvantage at present owing to the difficulty of securing sufficient pickers.

The soil on the lands I surveyed is generally good, but rather shallow. The settler should have no difficulty in ranching successfully along the lines suggested, but as the soil readily dries out by drainage and evaporation, and as there is not depth enough to hold moisture against a long dry spell, he should specially consider those crops, such as cherries, etc., which come in early and are marketed before suffering from lack of moisture. Generally all the land must be irrigated, and the settler's first attention must be directed towards obtaining an ample supply of water. There is no lack of water in the district, the vast snow-fields and glaciers affording never-failing reservoirs, but the water is not always just convenient to the parcel of land in question.

The Canadian Pacific Railway Company runs a daily (except Sunday) boat service on the lake from Nelson north to Kaslo, and including Sundays from Nelson south to Kootenay Landing. Twice per week the boat runs north to Lardeau from Kaslo and once per week calls at Johnson's Landing and Argenta. Once per week the train runs from Lardeau to Gerrard, on Trout Lake, passing through Howser and Poplar. The boats will generally call at almost any landing on the lake on being signalled, but at some of the smaller places will only call when special arrangements have been previously made.

Generally communication from settlement to settlement must be by boat, for the shores are very rugged and roads are difficult to build. The Government departments are, however, steadily going ahead with road-construction and are gradually linking up the different settlements.

There are public schools at the following places: Queen's Bay, Princess Creek, Ainsworth, Argenta, and Meadow Creek, whilst in Kaslo City there are very good public and high schools. There are churches in Queen's Bay and Kaslo. Practically every settlement has its post-office, and in addition the following places are able to communicate by telephone or telegraph to outside points: Queen's Bay, Ainsworth, Princess Creek, Mirror Lake, Kaslo, Lardeau, Shutty's Bench, Meadow Creek, Howser, and Poplar.

I have, etc.,
H. D. Dawson, B.C.L.S.

UPPER COLUMBIA VALLEY, KOOTENAY DISTRICT.

By L. F. Grant.

North Lonsdale, B.C., November 11th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I beg to submit the following report on my work during the season of 1920 in the Upper Columbia Valley between the Southern limit of the Railway Belt and Lake Windermere:—

Originally explored in 1806 by David Thompson, surveyor to the North-west Company at Montreal, the valley may be considered, from the point of view of settlement, as one of the oldest in the Province.

Until comparatively recently the settlers in this district depended entirely upon road and river transportation—the first expensive and the latter available for only half the year—and development was consequently slow. In 1905, however, work was begun on the Kootenay Central Railway, a subsidiary company of the Canadian Pacific, and in 1915 construction was finished between Golden on the main line, and Lake Windermere.

The altitude of the land along the river varies from about 2,580 feet at the edge of the Railway Belt to about 2,620 feet near the lake. The land surveyed by the writer was nearly all higher than this.

The climate of the district is subject to a range of temperature from about —30° F. to 90° F. during ordinary years. Early frosts are not uncommon, and this season one was first noticed on September 1st, when the writer's party was camped at an altitude of about 2,600 feet. Precipitation varies somewhat and decreases steadily as one ascends the Columbia, until at Lake Windermere it is only about 11 inches. Judging by the vegetation, a much heavier rainfall is found up the tributary creeks, probably due to the greater altitude. But in general it may be said that irrigation is necessary anywhere in the region under consideration.

There is a very large area of summer range available for ranching, but the number of cattle is, of course, governed by the amount of hay that can be grown for winter feeding. This is at present somewhat limited. Dairying has not been developed to a very great extent in the valley, although there is a ready market for all dairy products. In general root-crops do very well, as do most of the legumes. Mr. Newton, of the Dominion Experimental Station at Invermere, told the writer that there is a very good opportunity in the cultivation of field peas, for which conditions are well suited and which command a good market in the Prairie Provinces. Tree-fruits have not been very successful, but excellent small fruits are grown, although they ripen somewhat late to command the best markets. The colonies of bees at the Experimental Station have given results which compare very favourably with those at any of the stations throughout Canada.

With the completion of the Banff-Windermere Motor-road, which may be looked for in two or three years, it is reasonable to expect that a large number of motor tourists will visit the valley every summer, and that there will be a much bigger local market for fresh fruit, vegetables, eggs, and dairy products than at present exists. In this connection it is of interest to note that the Canadian Pacific Railway has established a large summer camp at Invermere, which it is hoped will become a very popular summer resort.

With special reference to the land surveyed during the past season, it may be said that it varies greatly. With the exception of the tract on Horsethief Creek (Lots 12870 to 12876), much of it is held under pre-emption record and is therefore not open to new settlers. There is a limited amount suitable for general farming in those lots opposite Brisco, though the clearing is fairly heavy. The same may be said of Lot 12862, which is the only unalienated land surveyed in the vicinity of Edgewater.

The Horsethief Creek land is especially well suited for hay. This land is nearly all logged off and clearing will be comparatively cheap, and as the land lies along the valley of the creek the problem of irrigation will be easily solved.

Living conditions in the Columbia Valley are good. The roads are for the most part excellent, schools are numerous, and the climate, except when at its extremes, a most pleasant one. The Dominion Government operates a telephone system through the valley, and the services of the Experimental Farm at Invermere should be of the greatest value to settlers.

A number of returned soldiers engaged in beating their bayonets into hoes and their machine-guns into spiked-toothed harrows (if one may paraphrase the Scriptural expression) have settled in the valley, and all of these whom the writer had the opportunity of interviewing were optimistic as to the future.

As in most other parts of the Province, the settler of limited capital will need to work for wages from time to time until he can make a farm pay, and it is of interest to note the conditions as regards development in the district.

Besides agriculture, the most active industries are lumbering and mining. Both of these employ large numbers of men at good wages, but it must be pointed out that activity in these lines of production is uncertain and depends upon their respective market conditions outside the Province, and indeed outside of Canada. Cutting railway-ties is quite a flourishing little industry, and at the price of 70 cents for No. 1 ties and 60 for No. 2, very fair earnings can be made by men familiar with this class of work.

Road-building and, it is regrettable to add, fire-fighting furnish a good deal of employment during the summer, and indeed, so far as the past season is a criterion, there has been more work of various kinds in hand than could be successfully carried out by the labour available. Wages paid for road-construction and similar work averaged $4.50 a day and $9 for teams with teamster. During the winter many of the settlers do very well in trapping. It may be added that this section is one of the best game countries in British Columbia.

I have, etc.,

L. F. GRANT, B.C.L.S.

VICINITY OF CRANBROOK.

BY JAMES T. LAIDLAW.

CRANBROOK, B.C., December 29th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report of the work done near Cranbrook, East Kootenay:—

Cranbrook is the principal town and distributing centre of the district. The work consisted of the survey of pre-emptions and of expired timber licences. Taking Cranbrook as the centre, the lots are within a radius of 40 miles of here; from Waldo and Kingsgate to the south, Wolf Creek to the east, north to Skookumchuck River, and west to St. Mary Lake. A good road runs between these points.

Three timber licences were divided into fourteen blocks of 80 and 160 acres. These are at Tata Creek, 5 miles up the Kootenay River from Wasa, which is on the Kootenay Central

Railway, where there is a general store, post-office, and school. Tata Creek is 19 miles from Cranbrook, to which is a good road. From these lots the merchantable timber has been cut, leaving some small pine, tamarack, fir, and spruce suitable for fencing and domestic purposes; occasional patches of willow and alder occur. These lots are on rolling bench lands, distant from the Kootenay River 1 to 2 miles, and at an elevation of 2,700 to 2,800 feet, or 200 feet above the river.

The soil is a sandy loam, which is of a heavier character near the creek-bottom. A portion of three of these lots has been cultivated, and a good crop of potatoes, vegetables, and several kinds of grain obtained. Berries and young orchards are doing well. All of the lots have a good growth of pine-grass with some peavine, making a suitable summer range.

Three pre-emptions were surveyed on the west bank of the Kootenay River a mile west of Waldo. These consist of a portion of the bottom lands and the balance on the benches, which run from 100 to 200 feet above the river. The land is easily cleared and consists of sandy loam, and the work done shows it to be productive. Waldo has a general store, two lumber-mills, and is on both the Canadian Pacific and Great Northern Railways.

Three pre-emptions and three blocks were surveyed on Gold Creek, which is 16 miles south-east of Cranbrook. There are some small meadows on Gold Creek which would furnish a settler with wild hay, enabling him to winter his stock; the balance of the land is rolling bench and is good grazing land. From Cranbrook to these lots is a good road, continuing as a trail down Gold Creek.

Two pre-emptions and a Government block were surveyed in the vicinity of Wolf Creek, which is 10 miles from Wasa, on the Kootenay Central Railway. The land, though lying in the foot-hills of the Rocky Mountains, is of a good sandy loam, and what work has been done on the pre-emptions shows it to be productive.

Three pre-emptions were done at Goatfell Siding, which is 4 miles west of Yahk, the junction of the Crowsnest Pass and the Spokane International Railway. These lots contain a small part of the valley land near the railway, the balance being side-hill rising steeply. At Kingsgate, on the International Boundary, and on the Spokane International Railway three pre-emptions were surveyed. These were mostly on the side-hill, timber-covered, and difficult to clear. Any settlers on the valley lands of the Moyie River, however, appeared to be doing well.

I have, etc.,
Jas. T. Laidlaw, B.C.L.S.

HOWE SOUND, SECHELT INLET, AND JERVIS INLET, AND NEW WESTMINSTER DISTRICT.

By J. A. Walker.

Vancouver, B.C., December 31st, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit herewith my report, descriptive of the territory in the vicinity of Howe Sound, Sechelt Inlet, and Jervis Inlet, New Westminster District, in which I have carried out survey operations during the past season.

The work consisted of the tying-in by traverse and triangulation various surveyed lots and the survey of pre-emptions in the above localities. H. H. Roberts completed the Howe Sound work, including the tying-in the Dominion Geodetic Survey Station on Mount Gardner, Bowen Island, and the Astronomical Pier at Squamish. I relieved Mr. Roberts on September 3rd, took over his outfit and party, and proceeded by launch to Sechelt Inlet.

Howe Sound.

Although Howe Sound is well known, a few remarks in passing may not come amiss. There is a daily boat service to Squamish; these boats make connection with the Pacific Great Eastern Railway, which maintains a tri-weekly service to the Cariboo. In addition, there is a daily boat service in summer to points on Bowen and Gambier Islands and west shore, chiefly for the accommodation of the summer residents.

The chief industrial activity is, of course, centred at Britannia Beach, where the huge plant of the Britannia Mining and Smelting Company is in operation. There are two pulp-mills, one of the Whalen Pulp and Paper Mills, Limited, at Woodfibre (Mill Creek), of 100-ton daily capacity, and the other of the Western Canada Pulp and Paper Company at Port Mellon (Rainy River), of 20-ton capacity. Besides the above, there are gravel and crushed-rock plants and several logging camps. Mixed farming, especially sheep-raising and the growing of small fruits, is steadily increasing. Fishing is carried on more or less. There are numerous summer hotels throughout the district and in the summer months Howe Sound presents a very animated appearance indeed.

SECHELT INLET.

Sechelt Inlet is about 20 miles long and from 1 to 2 miles wide, and is bounded on the west by the Sechelt Peninsula and on the south is separated from the Strait of Georgia by Sechelt Isthmus, which is a little over half a mile in width. On the east are two inlets, Salmon Arm and the Narrows Arm, which bodies of water stretch into the mainland approximately 12 and 10 miles respectively. On the north is the only means of access to Sechelt Inlet—viz., Skookumchuck Narrows. There is a great tide-rip here and the narrows may be negotiated only at either high or low slack water. There is no difficulty then for any power-craft or tugs. Tows of logs or scows are taken through continuously.

Sechelt is a well-known summer resort on the isthmus, and on account of its strategic situation is the distributing-point for Sechelt Inlet and therefore maintains a considerable activity in winter trade. A daily boat service is maintained by the Union Steamship Company, except in the winter months, when there is no up-Coast boat from Vancouver on Sunday.

There are in Sechelt a general store, hotel, Dominion Government telegraph-office, post-office, and numerous summer cottages. On the inlet side of the isthmus there is a good wharf, also a shingle-mill. It is understood that a sawmill is about to be built. Sechelt is connected to Gibson's Landing and other points by a good highway. There are also several trails leading out from Sechelt. East of Sechelt Townsite is a large Indian reservation, and to the east of this is another summer resort, Selma Park, which has a wharf at which the steamers call in the summer months.

The mountains on the east and west rise to a height of from 2,000 to 5,000 feet, those on the east being, as a whole, higher. A few peaks lying between Narrows Arm and Salmon Arm and at the head of these arms are over 7,000 feet. Numerous creeks of various sizes, though mostly small, flow into the inlet, and the general character of the country is therefore rather broken and the actual soil is found in pockets.

There are a considerable number of settlers, but chiefly along Sechelt Inlet proper. They are gradually getting the best of their holdings under cultivation. They are able, as a rule, to augment their incomes by fishing or logging near their homes. As yet very little produce is grown outside of roots and garden-truck.

The chief industries are logging and fishing. At the head of Salmon Arm, at Clowham Falls, there is a large shingle-mill. Numerous logging camps of various sizes are in operation on both Narrows and Salmon Arms, as well as Sechelt Inlet. A great many men are engaged in hand-logging on their own account. Fishing is carried on, but mostly towards the Skookumchuck. Cod, herring, and various species of salmon are the chief catch.

The timber is chiefly fir and at various points there are some good stands of cedar. There is also considerable hemlock, a small amount of balsam, a negligible quantity of spruce, and some maple, alder, and dogwood.

Salmon Arm is usually quite choppy, especially in the autumn and winter, while Narrows Arm is comparatively calm. Sechelt Inlet is usually quite calm, being well sheltered, but occasionally becomes choppy, especially off Salmon Arm and below Skookumchuck. There is comparatively little tide-rip at the narrows in Narrows Arm. There are a few good anchorages in Sechelt Inlet and Narrows and Salmon Arms outside of wharves or floats, chiefly in Porpoise Bay, below Skookumchuck Narrows on the east side and Storm Bay in Sechelt Inlet, at the head in Narrows Arm, and across from Siwash Creek in Salmon Arm.

There are a post-office, giving a weekly service, a Dominion Government telegraph-station, and a school at Dorriston, a little south of the Skookumchuck on Sechelt Peninsula.

At Sechelt the Dominion Government Astronomical Pier was tied in to an original lot corner, and two pre-emptions near Porpoise Bay, one near the head of Narrows Arm and one at the

south end of Skookumchuck Narrows on Sechelt Peninsula, were surveyed. In addition to the above, ties by triangulation and shore traverse were made in Salmon Arm, Narrows Arm, and Skookumchuck Narrows. Narrows Arm was triangulated from near the narrows to the head.

Jervis Inlet.

Jervis Inlet stretches inland, winding in a northerly and easterly direction for a distance of about 40 miles from Malaspina Strait at Scotch Fir Point and the north-westerly point of Sechelt Peninsula (Pender Harbour). Nelson and Hardy Islands lie in Jervis Inlet off Malaspina Strait.

For the most part the shore-line of Jervis Inlet consists of bold rock bluffs, in some cases rising abruptly several hundred feet from the water. The mountains on either side rise to a height of from 3,000 to 5,000 feet and towards the head there are a few peaks from 8,000 to 9,000 feet. There are, however, innumerable small parcels of good agricultural land at tide-water most of which are held either by Indian reserves or taken up by settlers.

Pender Harbour is the chief distributing-point for the inlet. This harbour is well sheltered. In Pender Harbour there are three stores, a hotel, and a school. A daily boat service similar to Sechelt is given. There is also a post-office (Irvine's Landing) and a telegraph-station. Here practically the total catch of fish in Jervis Inlet is transhipped to Vancouver.

From Pender Harbour a large gas-boat gives a weekly (on Saturday) passenger, mail, and freight service to Egmont and other points towards the head of Jervis Inlet. The Union Steamship Company's boats give a weekly service to Hardy Island and a bi-weekly service to Nelson Island.

Egmont, on the mainland, at the north end of Skookumchuck Narrows, is a secondary distributing-point for Jervis Inlet. There is quite a fleet of fishing-boats here. There are a store, school, and Dominion Government floating wharf at Egmont. About 1½ miles below on the mainland there is a post-office. The Dominion Government established a telegraph-station here in November. Near the post-office there is a small gas-boat repair-shop with marine ways. Across from Egmont there is a machine-shop.

The greater portion of the country is covered by timber licences. Owing to the nature of the country the settlers, of whom there are considerable number, are more or less isolated. It would appear that most of the settlers are engaged in logging and fishing and have taken up small areas where suitable, chiefly to have homes for themselves. The social amenities at first would seem almost nil, but as most of them have gas-boats they are enabled to overcome the drawbacks of their isolation and to provide for themselves more or less social intercourse and entertainment.

North and east of Pender Harbour on Sechelt Peninsula, adjacent to Sakinaw, Ruby, and Killarney Lakes, there is a considerable area that will, when cleared, be good agricultural land.

The most important industries are logging and fishing. There are a great many logging camps situated along the entire stretch of Jervis Inlet. Fir and cedar are the chief output. There is a great quantity of hemlock which could be utilized by the increase of the tannery industry on the Coast. Fishing is largely carried on out from Pender Harbour and Egmont. Herring, cod, and salmon are the chief fish taken. There are two canneries on Agamemnon Channel. All along Jervis Inlet, and in Princess Louise Inlet especially, dogfish abound in unlimited quantities. There would appear to be a paying proposition in the establishment of a plant to extract the oil and to make fertilizer from this species. There are several quarries along the inlet, the most important probably being the granite-quarry on Hardy Island. It is understood that this quarry is to be reopened shortly. There is an abandoned slate-quarry south of Deserted Bay.

Jervis Inlet provides very little good anchorage for the craft on its waters, except in the bays, which are few and far between. Although inland, it gets very choppy at times; the worst seas perhaps are off Egmont Point at the intersection of Jervis Inlet, Skookumchuck Narrows, Hotham Sound, and Agamemnon Channel. It also gets very rough at times off Vancouver Bay. South of Hardy Island in Blind Bay is a favourite shelter for tugs with their tows when caught in Malaspina Strait. There is very little tide-rip at the narrows of Princess Louise Inlet.

Pre-emptions at Egmont, Princess Louise Inlet, and on Sakinaw Lake were surveyed. Ties by shore traverse were made on the north shore of Jervis Inlet, north of Hardy Island. Ties by triangulation were made from Hardy Island to the mainland north of Scotch Fir Point and from Hardy Island to Nelson Island.

GENERAL.

Pender Harbour, including Sakinaw and other lakes, Nelson Island and Sechelt, offer splendid inducements to the summer camper. There are hotels and cottages at these points and rowboats and canoes may be rented from the management.

Generally speaking, the soil on the pre-emptions which were surveyed is of sandy or gravelly loam with clay subsoil. In a very few instances a mixture of peat with black and clay loam was noticed. However, the majority of the pre-emptions were, as a rule, quite rocky and broken, and, as stated before, the soil is found only in comparatively small areas.

To the writer's knowledge there are no actively producing mines, outside of development-work, in the country covered by this report. (This, of course, excludes Howe Sound.) Copper and silver and gold and galena in small quantities have been found, chiefly in the area between Jervis Inlet and Narrows Arm.

About the only water-power developed at present is on Clowham River at the head of Salmon Arm. Hotham Falls on the east side of Hotham Sound would appear to be a likely source of power, having above it, as it has, Freil Lake for storage. Romona Falls near the head of Narrows Arm would develop a small amount of power for possible local requirements. There is a good flow during the autumn months, and although there is not a very large watershed it is understood the creek maintains a good volume in the low-water period.

Deer were the most plentiful game seen and occasionally a few bear were encountered. Ducks of various species were very numerous; a few songbirds were noticed near the Coast. In fresh water trout was the most important catch.

The most striking phenomena in the climatic conditions in this territory during the past season were the abnormal amount of rain, especially during September and October, and the high temperature maintained. From September 8th, when the rain set in, to the end of the month there were nineteen days in which rain fell, the total amount being about 10½ inches. There were nineteen days in October, twenty in November, and nine to December 11th in which rain fell. Severe gales raged from November 26th to December 10th, with few cessations. About the end of October and the first part of November there were a few light frosts, but on the whole the weather was quite mild. When we left on December 11th for Vancouver there had been no snow at sea-level, although some sleet fell for a short time in Salmon Arm early in October and again in Jervis Inlet late in November.

I have, etc.,

J. ALEXR. WALKER, B.C.L.S.

RANGES 1 AND 2, COAST DISTRICT.

BY JNO. ELLIOTT.

VANCOUVER, B.C., October 27th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following general report on surveys made by me in Ranges 1 and 2, Coast District, during the past summer:—

I commenced operations in the vicinity of Takush Harbour, on Smith Sound, where a large number of pre-emptions had been taken up about seven or eight years ago. At the time of my last visit, in January, 1916, there were, including those at Millbrook Cove (on the north side of the sound), about thirty settlers in the district. It is true that a great many of them lived on floats in Fly Basin and were pre-emptors in name only; still, most of them had built some sort of a house on their land; one or two had horses and goats; they had a post-office, a fortnightly steamboat service, the Government had built about 4 miles of trail, and there was every indication of the establishment of a permanent settlement. I was therefore surprised on my return this summer to find none of these settlers on the land. Judging from evidence found in the various deserted houses which I examined, a general exodus took place in the summer of 1916, since which time the district has been practically unvisited. This is rather peculiar, because of all districts I have seen during five seasons on survey of pre-emptions on our coast-line this is the most likely looking spot for the establishment of a community. The country, though generally hilly, is interspersed with considerable areas of level and practically open land, of the class

usually described as muskeg, but this description is generally a misnomer here, as I found that usually the top layer of peat or moss was comparatively shallow. The soil underneath appears to be generally a compact mixture of clay and sand, with occasionally very narrow streaks of gravel, but I noticed that along all the larger creeks, and extending for a short distance from them on either side, the soil was either blue clay or pure sand. Moreover, as these creeks are generally in fairly deep ravines, the draining of the land should not be a very difficult matter.

Against these seeming advantages must be set the district's isolation, its inaccessibility, being over 200 miles by water from any permanent and extensive market. Of course, during the continuance of the salmon-fishing there will always be a small local market and field of employment for a short time each year, and this will no doubt be augmented when, with the exhaustion of the more accessible supplies, it becomes necessary to utilize the timber in this district. While I have no positive information as to climatic conditions, I would judge by appearances that this district is one of heavy precipitation and scanty sunshine, the latter condition being, in my opinion, the greatest drawback to the country and responsible for such faults as have been accredited to the soil, and which, together with the exposure to the ocean breezes, is no doubt responsible for the stunted forest-growth on this portion of the coast.

Finding conditions as I did, I decided to survey only such pre-emptions as were held by returned men and such others as could be readily done in conjunction with them, and leave the balance of this district for further consideration. In this way I surveyed in all ten pre-emptions, eight on the mainland and two on Table Island, which lies in the mouth of Smith Sound, practically in the open Pacific, and which, although it is level, low-lying, and easily cleared, and has apparently very fertile soil, consisting of from 1 to 3 feet of peat on disintegrating rock, is nevertheless so exposed to every storm that blows and is so lacking in shelter in which to keep a boat that I do not think its occupation should be encouraged.

From here I moved down to Blunden Harbour, where I surveyed two small islands held under application to purchase by residents in the vicinity who desire them for home-sites. Thence proceeding down the coast, I surveyed a number of widely scattered pre-emptions, which I will not describe in detail, as they are all very much the same; and while I do not consider any of them as suitable for agricultural purposes, because where there is any area of soil it is generally covered with such a heavy growth of timber as to make the cost of clearing prohibitive, yet they are all suitable for the purpose of providing a home or headquarters for men engaged in hand-logging or fishing in the vicinity, and it was for this reason that they were taken up and are now occupied.

I also subdivided an expired timber sale on Blinkinsop Bay into five lots of approximately 20 acres each. This land has been logged over and most of it will be heavy clearing, but as it is just as good of any of the pre-emptions surveyed, there will no doubt be a demand for it for purposes mentioned in paragraph above.

The weather this season was abnormal; it rained almost continually in June and September, but in July and August I felt more really warm days and saw more bright sunshine, with less fog and wind, than I ever remember on this portion of the coast.

I have, etc.,

JNO. ELLIOTT, B.C.L.S.

VICINITY OF FISHER CHANNEL, COAST DISTRICT, RANGE 3.

BY T. H. TAYLOR.

VANCOUVER, B.C., November 15th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report of the work done by me in Range 3, Coast District, during the past season:—

My work consisted chiefly of a triangulation survey of Fisher Channel and Gunboat Passage, besides a few scattered pre-emptions, tie-lines, and two lighthouse-sites for the Dominion Government at Pointer Island and Driad Point.

As the fishing season was at its height, I had considerable difficulty in securing a launch at Namu, but eventually managed to secure one, which, although not as good as I would have

liked, answered the purpose. Unfortunately the launch which I had hired at Vancouver broke down on its way up the coast.

My first work consisted of two pre-emption surveys near Namu, two pre-emption surveys at Koeye River, and several tie-lines connecting up surveyed timber limits.

I then proceeded to Safety Cove and made a tie survey from Lot 13 to old triangulation by C. C. Smith, B.C.L.S.

FISHER CHANNEL TRIANGULATION.

This body of water lies in a northerly direction and is about 20 miles in length, averaging about 2 miles in width. It connects Fitzhugh Sound with Dean and Johnson Channels, Gunboat Passage, and Cousins Inlet. Several good harbours affording splendid anchorage and shelter lie along this channel. The shore-line is rocky and precipitous, covered with cedar, spruce, hemlock, and larch, and is valuable for pulp-wood. Several logging camps are in operation.

I commenced my survey at Walker Point, where C. C. Smith, B.C.L.S., had left off the previous season; thence running northerly to Johnson Channel, connecting to the survey made by A. E. Wright, B.C.L.S. Considerable difficulty was found in establishing a base-line, as the shore-line is rough as a rule. However, I managed to establish a base some 110 chains in length by a traverse, carefully chaining all courses and checking same by stadia. Iron posts with stone mounds were planted at all important points by drilling a hole in the rock, then inserting a wedge and driving in the iron post, which was split. Station numbers were marked on same. This makes a very permanent monument which will last for years and which can be readily located. A great many of the old triangulation points have disappeared, and I would suggest that iron posts be planted at the few remaining ones next season if any surveyor is working in the district.

Pointer Island lighthouse-site was surveyed. This is a small island situated at the easterly end of Lama Passage. All the large boats to and from the north pass this light, as it is on the regular route.

All surveyed lots were tied on triangulation except I.R. No. 11; not having enough information, I was unable to find any of the old posts.

Several tracts of good pulp-timber lie along this channel.

GUNBOAT PASSAGE.

The next portion of the coast to be triangulated was Gunboat Passage from Fisher to Seaforth Channel, where I connected with the triangulation made by A. E. Wright, B.C.L.S. Gunboat Passage is a narrow tortuous channel at the easterly end, widening out at the westerly end. A great many reefs are seen at low tide. This passage is rarely used by the larger boats. The Union Steamship Company sometimes uses it as a short cut from Bella Bella to Ocean Falls. A good base-line was secured at Johnson Channel by the survey of the Oscar Bainbridge pre-emption (Lot 1334).

A lighthouse-site was surveyed at Driad Point, at the northerly end of Plumper Channel, also one pre-emption on Cunningham Island, besides tying in all existing surveys. Iron posts were planted as on the Fisher Channel triangulation. Pulp-wood timber of a fair quality was seen along this passage.

GAME.

The game in this part of the country consists chiefly of Coast deer, geese, and ducks, which are fairly plentiful in some localities. We were always able to procure a supply of fresh salmon for our own use, either by trolling or from one of the numerous fishing-boats plying in the neighbourhood.

CLIMATE.

From July 1st to about September 10th the weather was delightful, the days being generally bright and sunny, very little rain falling. The following month it rained almost every day, but I believe this was the case all along the coast.

GENERAL.

The majority of the pre-emptors live by fishing in the summer; hand-logging for the pulp-mills and trapping in the winter. The fishing season has been a very successful one. Cultivation of the land is limited to a very small area, as the soil is mostly rocky and muskegy and the clearing heavy.

The chief settlements in the district are Bella Bella and Namu, where supplies can be obtained at reasonable prices. Large canneries are engaged at both places in the salmon-canning industry, also sawmills for making boxes and supplying the local market with lumber. The Union Steamship Company's boats call there twice a week during the fishing season and once a week during the balance of the year. These points also have postal facilities.

No outcroppings of mineralized rock were encountered of any commercial value. Several ledges of good lime-rock have been staked at Koeye River and Gunboat Passage. This lime is used, I believe, for pulp-making purposes.

I have, etc.,
T. H. Taylor, B.C.L.S.

COAST, RANGE 1, AND SAYWARD DISTRICT.

By John Davidson.

Victoria, B.C., December 31st, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on the past season's survey operations carried on by me in Coast District, Range 1, Sayward District:—

The work consisted of the survey of lands held under pre-emption and vacant Crown lands at various points along the Coast, including Chatham Point, Johns Point, Horn bay, Churchhouse, Seymour Narrows, Sutil Channel, Henry Point, Plumper Bay, etc.

Triangulation surveys were made in Range 1, Coast District, between Johns Point and Henry Point, tying in Channel Island, Owen Point, Hall Point, Gomer Island, Denham Island, and the east shore of Cardero Channel from the south-west corner of T.L. 34679 to the north-west corner of S.T.L. 43761. In the Sayward District triangulation ties were made between Brown Bay, Mount Lolo, Plumper Point, and Separation Head. Hill Island was tied to Burwood Bay, Viner Point, Camp Island, and Whaleton Bay. The boundaries of Indian Reserve No. 4 at Orford Bay, Bute Inlet, were defined on the ground.

The areas surveyed during the season lie on the coast-line, and having well-protected natural harbours are readily accessible by boat from the nearest port of call of the regular weekly service of the steamers from Vancouver. The average journey from Vancouver to any place in this vicinity is about thirty hours. At the port of call there is, as a rule, a good general store, a post-office, school, and in many cases a telegraph-office. All of the areas surveyed are within easy reach of these conveniences. The coast-line is rough and rocky, with small bays of shingle beach. The land lies on side-hills, sloping more or less steeply to the sea, and only a small percentage of the areas surveyed is suitable for cultivation. This is found on the flats and in the draws draining into the bays and on the flatter slopes. The soil varies from a black muck and loam on the flats and in the draws to a light sandy loam on the lower slopes. The subsoils are varied, the most common being a hard-pan and rock.

The district is suitable for the raising of vegetable-truck, the small fruits, apples, and for pasture. Several settlers are now breeding sheep with a fair amount of success. On the land surveyed, wherever cultivation has been attempted it has been successful. Notable examples are P.R. 2984, apples, berries, red and black currants, and vegetables. P.R. 118, potatoes, vegetables, strawberries, and hay. P.R. 362, potatoes and vegetables. A ready market is found for all produce in the various logging camps throughout the district.

Timber.

Most of the merchantable timber has been removed from the areas surveyed, but there still remains on an average about 150,000 feet of hemlock, cedar, and fir on each of the lots.

To clear ready for cultivation costs from $200 to $600 per acre, depending on the number and character of the stumps. The usual practice is to slash and burn the underbrush and second growth, leaving the stumps to be dealt with later. By this means the settler can readily place under cultivation a garden-patch and obtain sufficient hay and pasture land for his immediate needs, and at a low cost.

Throughout the district there is an abundance of good creeks and there is a plentiful seasonable rainfall. Summer frosts are unknown and the snowfall is light and of short duration.

GAME AND FISH.

A few of the settlers make a livelihood by trapping mink and marten, cougar and bear. Deer are fairly plentiful on the mainland and on Vancouver and Quadra Islands. Ducks are plentiful in the season, especially around Bird Cove. Blue grouse and a few willow-grouse are found everywhere.

While not as plentiful as in former years, the salmon run attracts many settlers and provides them with a fair living. Some settlers fish cod the year round and sell their catch to the nearest logging camp.

I have, etc.,
JOHN DAVIDSON, B.C.L.S.

VICINITY OF POWELL RIVER AND MYRTLE POINT.

NEW WESTMINSTER, B.C., December 26th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on survey operations during the past season:—

This season's work was similar to that carried out last year, and consisted chiefly of dividing logged-off timber lands in the vicinity of Powell River and Myrtle Point into 20- and 40-acre lots.

The party was organized in New Westminster and proceeded by steamer to the town of Powell River. This town is situated on the east side of Malaspina Strait, about 80 miles north-west of Vancouver. It has a population of some 1,500 people, 900 of whom are employed by the Powell River Company in their paper-mills. This company is preparing to enlarge its present mill and in addition to erect a separate lumber and shingle-mill. It intends also to erect a number of new houses for the use of its employees. There is no doubt that the population, and consequently the demand for farm products, will be considerably increased in the next three or four years. In addition to the paper-mill, there is at present a small sawmill in the town and two shingle-mills in the immediate vicinity. There is a good hotel, post-office, telegraph-station, public and high school, two churches, two general stores, and a number of small stores.

The Union Steamship Company operates a daily boat service between Vancouver and Powell River. These boats stop at all way-points, including Lang Bay and Myrtle Point. The trip takes from eight to ten hours on these boats, depending on the amount of freight handled. In addition to the above, both the Union and Canadian Pacific Railway Steamship Companies have boats calling at Powell River at regular periods during the week. There is telegraphic communication to Vancouver and Victoria and also to points in the vicinity on the Coast.

LANDS SURVEYED.

Our first camp was located on the sea-coast, 2½ miles south of Powell River, and the first work carried out consisted of dividing Lots 5099 to 5131 (inclusive) into half-lots of 20 acres each. These lots lie between 2½ and 4 miles from Powell River.

On the completion of the above work we commenced the subdivision of T.L. 10619P, T.L. 31602 and Lot 3039. This land adjoins the south and east boundaries of the Powell River Company's property and is composed of logged-off timber lands. This area was divided into sixty parcels of approximately 20 acres each.

As the sea-shore adjoining the Powell River Company's property was much in demand for building-sites, it was thought advisable to lay off some small lots. Fourteen 1-acre lots were therefore laid out in the best location.

Our next camp was located at Myrtle Point, about 12 miles south-east of Powell River, and T.L. 39611, T.L. 39990, and Lot 3825 were subdivided. Twenty-one lots, varying in area from 40 acres to 140 acres, were surveyed here. This area is situated on Malaspina Strait, about 2 miles from the wharf at Myrtle Point, which is the terminus of the Bloedel, Stewart & Welsh logging-railroad. This company carries on extensive logging operations in the vicinity of Haslam Lake and expects to operate from this point for the next seven years. There are two squatters

on this area who have made considerable improvements. These men have been in occupation for a number of years and were dealt with in accordance with your instructions. A lot 15 acres in area was surveyed for the Forestry Department and is being used as a district headquarters.

Our next camp was located in Lots 2742 and 2743, about midway between Myrtle Point and Lang Bay and about 1½ miles from Malaspina Strait. From this camp we laid out fifty-two lots, varying in size from 40 to 50 acres. This area has been logged off and recently burnt over, the north-east corner being burnt over during this last summer. Wolfsohn Creek, which flows from Haslam Lake to Lang Bay, runs through this area. No squatters were found on this area. One man has a small clearing and garden, but is living at Lang Bay.

Surface.

The general surface of all areas surveyed is gently undulating, with a gentle slope toward the sea on the west. Wolfsohn Creek flows through Lots 2742 and 2743 in a deep ravine and canyon, but the land on either side is fairly even. For the most part the land lies between sea-level and 300 feet elevation and the balance between 300 and 450 feet. There are three lots which rise above 450 feet.

Soil.

The nature of the soil varies so much at different points on the area surveyed that it is not possible to give here any detailed description. It appears to be of glacial origin supplemented by alluvial deposits. As a rule the higher points are composed of a stony sand soil, while the lower portions are composed of a fine silt and frequently have a surface of black muck. Some portions of the area surveyed appear to be too dry for successful cultivation and are generally too high for any reasonable irrigation scheme.

Clearing.

As mentioned heretofore, the areas subdivided consisted of logged-off timber lands. There has been a good stand of timber on all lots surveyed and consequently there are a large number of stumps to be removed. These stumps are chiefly fir and cedar, with a few hemlock and spruce, and are found as large as 80 inches in diameter. There is also some fallen timber which has not been removed by the loggers. In addition to this, on certain areas there is a dense second growth of fir and hemlock, some of which is 25 years old.

Climate.

The climate is very similar to that of Vancouver, but with probably less rainfall. The following is a table of temperature and precipitation and is given by the courtesy of the Powell River Company:—

Month, 1919.	Temperature.		Rainfall.	Month, 1920.	Temperature.		Rainfall.
	Max.	Min.			Max.	Min.	
	Deg.	Deg.	Inches.		Deg.	Deg.	Inches.
January	44.1	36.8	6.05	January	41.0	34.1	3.20
February	43.0	33.7	4.91	February	45.6	33.8	0.91
March	48.5	36.9	2.98	March	47.3	37.5	2.37
April	54.2	41.5	3.00	April	52.1	38.0	1.73
May	59.2	45.2	1.96	May	57.7	44.1	2.44
June	63.1	50.0	1.76	June	64.8	51.8	3.17
July	71.0	55.5	1.31	July	73.2	58.7	1.22
August	71.4	56.5	1.03	August	72.1	56.2	3.63
September	66.0	51.6	1.75	September	60.3	50.8	5.85
October	51.4	41.7	1.56	October	52.3	43.8	6.68
November	46.3	38.5	5.23	November	48.1	41.2	6.97
December	42.5	34.5	5.56	December	....	....	....
Total	....	....	36.10	Total	....	....	38.17*

* Eleven months.

Produce.

The land already under cultivation produces excellent vegetables and fruit. Strawberries, raspberries, and currants do very well. The chief question is one of water, as some of the ridges are very dry in summer.

Sheep and cattle at present range freely and forage for themselves the year round.

MARKET.

As mentioned before, the town of Powell River has at present a population of 1,500 people, 900 of whom are on the pay-roll of the Powell River Company. It is certain that the population will increase in the next three years. This town will provide a market for all local farm products for some time to come, and the large logging companies at Myrtle Point and Stillwater should also take care of large quantities.

ROADS.

There is a Government road running from Powell River to a point 4 miles south. It is proposed to extend this road half a mile east to connect with a disused logging-railway grade into Myrtle Point. There is also a Government road running eastwardly from Powell River to Powell Lake and Cranberry Lake. It is proposed to extend this road southwardly through the land surveyed and so give it access to Powell River.

In the areas surveyed at Myrtle Point and between Myrtle Point and Lang Bay there are enough old railway-grades to provide cheap roads for practically all lots surveyed. These lots would either have an outlet by road to Myrtle Point or Lang Bay, both of which places have wharves and steamship services.

GAME.

We had very poor success fishing this year, probably because we were at the Coast during June and August. The deer were plentiful in the earlier part of the season, but went inland before the hunting commenced. There are large numbers of blue grouse and a few willow-grouse were observed. The pheasants are also becoming more numerous and should provide good sport in years to come.

TRIANGULATION SURVEY, GARDNER CANAL AND VICINITY, RANGES 3 AND 4, COAST DISTRICT.

BY J. T. UNDERHILL.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—My season's work consisted in the triangulation of Ursula, Devastation, Kitsiway, and Douglas Channels, Kildala Arm, and Gardner Canal. The lower portion of Dean Channel west of Cascade Inlet, Fisher Channel north of Gunboat Passage, and Cousins Inlet were also surveyed, as well as two pre-emptions in Kemano Bay, Gardner Canal.

My work was conducted in a similar manner to that of last year, but this season I substituted painted-board targets in place of cloth, partly on account of expense, and also I found that the hard flat surface gave a more distinct and clear-cut target to sight upon. It was found also that weather did not affect these targets, whereas cloth suffers considerably in rain and wind.

The use of monuments of a permanent nature was a distinct step forward in the survey of our coasts. These monuments were made of ¾-inch iron and were split at the bottom and provided with a wedge. They were inserted in holes drilled in the rock and driven in, the wedge forcing the split portions apart and thereby holding the monument securely in place. The tops were of a square cross-section, allowing flat sides for purposes of marking. Where possible, cairns were built over the monuments, but this was found to be useless where they could be reached by the sea, as the wave-action quickly destroyed the cairns. In places of this nature bearing trees were used. An endeavour was made to have two monuments visible from any point on either shore. This would allow future surveys to be tied in for both distance and bearing. Where surveys already existed monuments were not set, as the old surveys, which were tied in this summer, constituted monuments in themselves.

URSULA CHANNEL.

This stretch of water, lying between Gribbell Island and the mainland, lies in a general northerly direction and is approximately 17 miles long, with an average width of 1½ miles. The shores are generally well timbered and except at the southern end are not unduly steep. In this area there would appear to be several parcels of land suitable for pre-emptions, more

particularly at the northern end, where the land flattens out to a gentle slope as it approaches Devastation Channel. Gribbell Island side is notable for the barrenness of the mountain-tops, large stretches of which have scarcely a vestige of vegetation. Bishop Cove and Goat Harbour furnish two good sheltered anchorages, while temporary anchorage may be obtained in front of several of the beaches.

The tides in this channel, more especially the ebb, are fairly strong, and are most noticeable at its southern and northern end, particularly the latter. Here at the junction with Devastation Channel the force of the outrunning water from Gardner Canal and Devastation Channel are most apparent and tide-rips are not uncommon.

The sea-life in Ursula Channel bears strong evidence of its nearness to the open Pacific. The presence of sea-anemones, sea-urchins, large mussels, clams, crabs, and other shell-fish, also cod, halibut, and many varieties of smaller fish, are everywhere apparent.

Devastation Channel.

This body of water, lying between Hawkesbury Island and the Mainland, is shaped very much in the form of the letter "L" reversed. Approximately 22 miles long and averaging a little over 1½ miles in width, it is bordered by well-timbered mountain-sides. The greater part of its shores have been taken up in the form of timber licences, but there would appear to be room for a few good pre-emptions on the south shore not far east of its junction with Ursula Channel. The shores of Devastation Channel slope back gradually from the water-line, and only in a few places do rock bluffs extend to the channel itself. Two islands are situated near the northern end of Devastation Channel close to the Hawkesbury Island shore. These islands are separated from Hawkesbury Island by Kitsiway Channel, dealt with later in my report.

The tides in Devastation Channel are fairly strong, being most noticeable at the junction with Ursula and Douglas Channels and Gardner Canal. At the latter point the tide ebbing out of Gardner Canal appears to split, part of the ebb running to the west and part to the north. This causes a small tide-rip in this area. It is here that most of the fishermen cast their gill-nets. The action of the tides, causing a kind of immense eddy, tends to keep the salmon moving in a large circle before a final dash for the rivers at the head of Gardner Canal is made. A similar but very much more modified effect is obtained at the junction of Douglas Channel. The only reef noticed in these waters is on the north shore opposite the junction of Ursula Channel. At this point a fish-trap belonging to the Western Packers, of Butedale, is in operation.

The marine life in this area shows the effect of its greater distance from the ocean. Shell-fish particularly are affected, the mussels and barnacles becoming very much smaller; while clams disappear altogether. Muddy water, due to rivers in Gardner Canal, makes its first appearance. Local inhabitants in this area declare that very bad seas occur at the junction of Gardner Canal and Devastation Channel during the winter months, particularly with a north wind.

Kitsiway Channel.

Kitsiway Channel, lying to the west of the two islands in Devastation Channel, is really a part of the latter channel itself. The portion between Hawkesbury Island and the more southerly of the two islands mentioned above is locally known as Blind Channel and goes dry at low tide, leaving a long stretch of mud-flats strewn with boulders at its northern end. Both ends of this portion of the channel afford excellent shelter for small craft. The shores are in all ways similar to those of Devastation Channel.

Gardner Canal.

This channel is approximately 54 miles long, with an average width of 1½ miles. About 25 miles from its head it passes through the Coast Range, and the portions of the channel on either side differ very much in general characteristics. To the west the shores are generally well timbered, with quite a number of beaches and bays, two of which, Triumph and Long Bay, being almost small channels in themselves. The mountains on the west conform to the general Pacific slope; that is, a general falling away from the Coast Range is quite noticeable, the features being less harsh as one approaches the mouth of Gardner Canal.

The portion of the channel lying actually in the Coast Range, about 7 miles in extent, is marked by high rugged mountains, badly torn and grooved by glacial action, and is very sparsely timbered with stunted hemlock, cedar, and spruce. It would appear that at one time

an immense glacier rested in the upper reaches of the canal, and finally, after a long period in which it tore and grooved the mountain range, burst its way through and proceeded on to the ocean. In doing so it smoothed off and gave a gradual slope to the west. Some of the grooves in this part of the channel are very large in extent and extend up practically to the tops of the mountains. To the east of this range the shores are bold and rugged, often being nothing but precipitous rock bluffs and generally sparsely timbered.

Several large cascades are seen in this part of the channel and glaciers on the tops of the mountains are common; by far the greater part of the fresh water running into Gardner Canal comes in this section. Besides the two rivers at the head, there are also two rivers flowing into Kemano Bay, and the Bruin River, which enters the canal immediately to the east of the rugged section before mentioned.

At the head of the canal the Kitlope and an unnamed river flow into the inlet. The Kitlope is quite a large river at its mouth and is bordered by low-lying land eminently suitable for agricultural purposes. There is room here for quite a few pre-emptions, but the inaccessibility of a market tends to retard development for some years to come. The other river flowing in here is very much smaller and its valley would only permit of a few pre-emptions at most. The two Indian reserves in the vicinity are entirely deserted, and I understand that the surviving Indians have moved to the Kemano Indian Reserve, some 20 miles lower down the channel.

The tidal effect in Gardner Canal is considerably affected by the great influx of fresh water. Even on a flood-tide the surface water has a slight flow down-channel, apparently there being a strata of more or less brackish water running above the salt water from the sea. This feature is emphasized on an outgoing tide, when the whole volume of water in the canal is moving outward to the sea. This channel appears to be free from reefs and other dangers to navigation.

The sea-life in Gardner Canal is less noticeable than in the other channels covered by me this summer. Deposits of silt are quite thick at points 25 miles down-channel, seeming to choke out sea vegetation. Shell-fish almost totally disappear before the head is reached, and no fish, other than salmon and flatfish, were seen in the upper reaches of the canal.

In winter this channel must be the scene of terrific down-channel gales. The stunted vegetation, with limbs on the down-channel side only, bear abundant evidence to this fact.

KILDALA ARM.

Kildala Arm, approximately 11 miles long and averaging a mile in width, lies between high rocky mountains, generally well timbered on their lower slopes. With the exception of the head of the arm, little or no level land is available for future development. The timber, and mineral if found, would appear to be its only natural resources. The tides are normal and no reefs or other obstructions to navigation were noticed. The sea-life here is similar in all respects to that of Douglas Channel, of which this inlet is an arm.

DOUGLAS CHANNEL.

Douglas Channel, lying between the west shore of Hawkesbury Island and the mainland, is approximately 42 miles long, with an average width of 3 miles. At its upper end it branches off into two arms—namely Kitimat and Kildala. At this point the channel approaches 5 miles in width, and in this area, owing to the different connecting arms and channels, tide-rips and seas are quite often experienced even in summer. In winter this stretch is known for its bad seas, particularly when a strong wind is blowing down Kitimat Arm.

Douglas Channel at its upper end is bordered by well-timbered mountains, the lower slopes of which are not unduly steep. As we proceed down-channel the mountains become lower and lower and more lightly timbered, until at the southern extremity the shores run out into low-lying spurs. The Hawkesbury Island side is on the whole rougher and not so well timbered, except in patches. Dotted up and down the channel there appear to be several small parcels of land that might be suitable for pre-emptions, but as my survey did not extend inland their real worth could not be determined.

The tides in Douglas Channel are moderately strong, the ebb being much more so than the flood. Driftwood and other floating debris, provided they are not caught on the intervening beaches, are carried out into Wright Sound. Kelp, a general indication of strong tides, is found in plenty along both shores. At the junction of Sue Channel, and at the mouth of the lagoon on the north shore opposite this point, stronger tides than in the rest of the channel are

experienced. At both these points tide-rips occur during the ebb tide. With the prevailing up-channel wind of summer, choppy seas are almost of daily occurrence.

The marine life in this channel is most abundant owing to its proximity to the ocean. Fish and shell-fish are plentiful and kelp and other sea vegetation are seen everywhere along the foreshore.

Kemano Bay and Pre-emptions.

Kemano Bay, on the north side of Gardner Canal, about 22 miles from the head, is a dirty, muddy, shallow bay at the mouth of the Kemano River. The bay itself is nearly landlocked; the Kemano Indian Reserve, consisting of a long, low-lying spit, half blocks its entrance. Originally, judging by the shore, this bay was a deep inlet off Gardner Canal, but the silt and sand brought down by the Kemano and the unnamed river flowing in here has, during centuries, more than half-filled the bay, and will completely do so in time. At low tide great stretches of mud-flats and sand-bars are exposed.

Two pre-emptions, Lots 1238 and 1239 were surveyed at the mouth of the Kemano River, one on either bank. These pre-emptions consist entirely of first-class land and if properly developed should make an excellent showing. The profusion of wild flowers growing along the banks of both rivers drew our attention at once. Another striking point immediately noticeable was the difference of the water in the two rivers; the Kemano, being muddy, denoting a larger valley with flat land; the other river, being clear, denoting a boulder valley with no bottom land. An attempt was made to go up the Kemano River and explore the lower reaches, but owing to high water and a very near accident this was abandoned. However, sufficient was seen to know that there is room for more pre-emptions in the valley, particularly on the north bank.

Portions of Dean and Fisher Channels and Cousins Inlet.

After completing the work in Range 4, Coast District, the bottom end of Dean Channel, Cousins Inlet, and portion of Fisher Channel were triangulated. This work was done in 1918 by Mr. Laverock, but owing to his untimely end by drowning, and the loss of his notes, could not be plotted.

The portion of Dean Channel lying to the west of Cascade Inlet is bordered by steep rocky mountain-sides, generally well timbered. Little or no level land suitable for agricultural purposes was seen, timber and mineral, if present, being its only resources. Elcho Harbour, on the north shore, 3 miles west of Cascade Inlet, is one of the few sheltered anchorages in this portion of the channel. It is a narrow inlet a little over a quarter of a mile wide and slightly over 3 miles long. Lying between high precipitous mountains, it affords excellent shelter to all craft in stormy weather. On the south shore, at the junction of Fisher Channel, the land flattens out considerably and is low-lying for some little distance inland. It is possible that room for a few pre-emptions might be found here.

The portion of Fisher Channel to the north of Gunboat Passage is bordered by well-timbered mountains sloping back more or less gently from the shore. The King Island side has a strip of low-lying land before the mountains proper are reached and is somewhat swampy, with here and there small lakes.

Cousins Inlet, running off from the head of Fisher Channel, is a narrow body of water lying between steep rocky mountains. At the head is Ocean Falls, where the Pacific Mills have their pulp and paper plant. The shores of Cousins Inlet are generally well timbered, most of the timber being owned by the Pacific Mills. All land suitable for agricultural or other purposes has already been alienated.

The tides in these waters are moderately strong but regular in their flow. With the exception of the tide-rip area at the junction of Dean and Fisher Channels, they deserve no special mention. At this point the ebb tides from Cousins Inlet and Dean Channel meet, forming a triangular tide-rip. With an up-channel wind a nasty sea is kicked up here. Rough weather is also common opposite the entrance to Elcho Harbour. It is said that this is one of the worst portions of the channel.

The marine life in this area varies as one gets farther and farther from the ocean. Fisher Channel and the lower parts of both Dean and Cousins Inlet abound in sea-life, which becomes less and less as one proceeds up-channel. The sea-life in Cousins Inlet is also affected by the presence of the pulp-mill at Ocean Falls, the waste products containing sulphur in various forms, being detrimental to some forms of marine life.

WEATHER.

The country covered by me this season is well known for its damp climate. Considerable rain fell during the latter part of May and the early part of June. July and August were generally fine and very warm. During this period vegetation showed very rapid growth and wild berries and flowers had matured before the middle of August. The shortness of the summer detracts from the value of the surrounding land for agricultural purposes. From the middle of August and during September we had little sunshine and considerable rain. No summer frosts were experienced, but I expect that the upper end of Gardner Canal is subject to them. Even in July the snow in this area was comparatively low down and blocks of ice and snow were encountered floating in the canal.

I understand that it is not uncommon for the upper end of the canal to freeze over during the winter. Moderate winds, generally westerly, prevail during the summer, but in the winter months severe east and north gales are more often the case.

MINERALS.

Indications of mineral were noticed in almost every channel covered, and three parties of prospectors, two under the Provincial Government scheme, were run across during the summer. At Drum Lummon, on the north shore of Douglas Channel, development-work is being carried on. Here they have a very good grade of copper ore. Beautiful specimens of peacock copper could be found in almost any of the workings. The Kemano River Valley is said to contain some very valuable mineral claims, but as the prospectors we ran across were very guarded in their remarks, it was difficult to determine the value or extent of same. Indications of copper, mainly malachite, were seen in a number of places in Ursula Channel, Douglas Channel, and in Gardner Canal. Some of the stains were large in extent. Bodies of iron ore are prominent in two places in particular. On the north shore of Gardner Canal 25 miles up-channel is a very large showing; also on the west shore of Hawkesbury Island almost opposite Kitkatla Bay.

GAME.

Game is plentiful throughout the area covered and is most noticeable in and around the mouths of the streams and rivers flowing into the various channels. Coast deer were seen everywhere, with the exception of the upper portion of Gardner Canal. Here mountain-goats are found in fair numbers, several being seen close down to the water even in July. Indications of bear may be found at the mouth of any stream, and tracks of wolves and cougar were noticed in the vicinity of Kemano Bay. Judging by the number of deadfalls run across, this country must be a trapper's paradise, Ursula and Douglas Channels being particularly noticeable in this respect.

Geese, ducks, and snipe were seen in fair numbers. Geese were breeding at the head of Gardner Canal in the sloughs and flats at the mouth of the Kitlope River. Most of the ducks seen, mainly siwash and sawbills, were in Douglas Channel, particularly at its junction with Devastation Channel. At this point they congregated in hundreds, snipe, ducks, and sea-pigeons were breeding on the small rock islet lying south-west of Coste Island in Douglas Channel. Trout were found in all streams fished.

WATER-POWER.

Several creeks and rivers, all in Gardner Canal, are capable of developing considerable energy when harnessed for power purposes. A list of these, with estimated horse-power, water-shed, etc., may be found in "Water-powers of British Columbia," by Arthur V. White, published by Commission of Conservation, Canada.

I am, etc.,

JAMES T. UNDERHILL, B.C.L.S.

GRENVILLE CHANNEL AND VICINITY, RANGES 3 AND 4, COAST DISTRICT.

By A. E. Wright.

November 10th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on the British Columbia coast channels triangulated this summer. These channels are the main steamboat channels used by all boats between Vancouver, Victoria, and the coast of Northern British Columbia and South-eastern Alaska, between latitudes 52° 47′ and 53° 55′.

The following bodies of water were triangulated in the order named: Sheep Passage, Hiekish Narrows, Graham, Fraser, and McKay Reaches, Wright Sound, Whale Channel, Lewis and Cridge Passes, and Grenville Channel. The distance covered amounted to over 180 miles, but includes the following inlets, which were also triangulated: Khutze, Lowe, Klewnuggit, Baker, and Kumeolon Inlets.

The actual work of triangulation was started at the junction of Sheep Passage and Mathieson Channel, where a monument was left in 1919. Permanent monuments were put in at the entrance to all unsurveyed channels and at 6- to 10-mile intervals along the main channels. This will facilitate the continuation of the triangulation along these channels and passages, besides affording a mark for future surveys to be tied in to.

Sheep Passage.

Sheep Passage, starting from the head of Finlayson Channel, extends first easterly, then north-easterly to its junction with Mathieson Channel. It forms the north boundary of Roderick and James Islands, is 13 miles long, and averages a mile in width.

From a point 2½ miles east of Finlayson Channel Griffin Pass bears away southerly, joining Mathieson Channel. It separates Roderick and James Islands and is about 15 miles long, varying in width from one-quarter to a mile.

The north shore of Sheep Passage is steep and rugged, with fair hemlock, spruce, and balsam on that part near Carter Bay and on Lot 332 near Mathieson Channel. The slopes of the mountains on the south shore are much gentler, with more timber, but what there is would be of more use for the manufacture of pulp than of lumber. The only flat land has been taken up as timber licences, and is so badly scattered that even were the timber logged off it is doubtful whether it could be used for agriculture.

Finlayson Channel and Hiekish Narrows.

Finlayson Channel at its head is 2½ miles wide, with gently sloping sides timbered with yellow and red cedar, hemlock, spruce, and jack-pine, with many dead tops. The ground is muskeg.

Hiekish Narrows connects Finlayson Channel with Graham Reach, separating Sarah Island from the mainland. It is not the main steamboat channel, as there is a bad rock near the north end, and the S.S. "Ohio," a large steel ship, lies on the mud in Carter Bay, at the head of Finlayson Channel, a reminder of the fact. The shores of Hiekish Narrows are rather well timbered with spruce, cedar, and hemlock, especially on the eastern shore.

Graham Reach.

Graham Reach stretches approximately north and south, a distance of 18 miles, from its junction with Hiekish Narrows and Tolmie Channel to Warke Island, varying in width from one-half to three-quarters of a mile. Swanson Bay and the lime-quarry 7 miles to the south are the only scenes of activity at present.

Green, Khutze, and Aaltanash Inlets reach easterly and Klekane northerly from Graham Reach. They are each about 6 miles long and half a mile wide and are rather well timbered. The Whalen Pulp and Paper Mills, Limited, have a camp logging off Lot 26 on the north shore, and a few hand-loggers are operating here and there.

The mountain-slopes of the mainland side of Graham Reach and adjacent inlets are the best timber lands seen during the summer. Hemlock, spruce, and cedar of a very good quality cover the mountain-sides, practically all of it held under lease by the Whalen Pulp and Paper Mills, Limited.

FRASER REACH.

The next shores to be triangulated were those of Fraser Reach, stretching north-westerly for 15 miles. Warke Island, 3 miles long and one-half mile wide, lies at its lower end, with Butedale Cannery on the Princess Royal Island shore opposite its upper end. North of Warke Island the mountain-sides are very steep, coming right down to the shore for a distance of 7 miles. There is no timber here, but north of this the mountains become less steep and there is a fair growth of hemlock, spruce, and cedar.

Princess Royal Island, which is separated from the mainland by Graham and Fraser Reaches, is steep and rugged. It is fairly well timbered with hemlock, spruce, and cedar and dotted with a great number of lakes, most of which are unmapped. It is about 50 miles long, with a maximum width of 26 miles.

MCKAY REACH.

McKay Reach is in the form of a letter "S" inverted, 8 miles long and from 1 to 2 miles wide. It separates Princess Royal from Gribbell Islands. Its shores are not precipitous, but the timber is, for the most part, better adapted to the manufacture of pulp than lumber.

WRIGHT SOUND AND WHALE CHANNEL.

Wright Sound is a wide stretch of water at the junction of several passages and channels. It lies immediately west of McKay Reach, and the following channels and passages branch off it: McKay Reach and Verney Passage on the east, Douglas and Grenville Channels on the north, and Lewis Passage and Whale Channel on the south. It has a maximum width of about 5 miles.

Whale Channel extends south from Wright Sound for about 14 miles, separates Gil from Princess Royal Island, and is about 3½ miles wide.

Lewis and Cridge Passages extend south-westerly from Wright Sound to Squally Channel. Fir, hemlock, spruce, and red cedar are seen on Hawkesbury, Gribbell, Promise, and the north and east portions of Princess Royal Islands, but as the open sea is approached, and the land becomes flatter, muskegs with jack-pine, yellow cedar, and scrub hemlock replace the larger timber of the steep mountain-sides. The whole of Gil, Farrant, and Fin Islands belong to this latter class.

GRENVILLE CHANNEL.

Grenville Channel extends north-westerly from Wright Sound for about 51 miles, and varies in width from one-half to 2 miles. It separates Farrant and Pitt Islands from the mainland. Both Pitt Island and the mainland opposite are composed of detached mountains from 2,000 to 3,000 feet in height, with a fair growth of hemlock, spruce, red and yellow cedar, and jack-pine on their sides. Practically all the surface between the mountains is covered with lakes, all unmapped.

The triangulation was completed by tying in to Lot 878, leaving monuments so that the triangulation can be carried forward up Telegraph and Arthur Passages and down Ogden Channel.

CLIMATE.

The climate is mild and moist, although some parts have a greater precipitation than others. On Graham Reach the maximum is reached in the vicinity of Swanson Bay, Butedale, and a corresponding maximum is reached on Grenville Channel at Lowe and Klewnuggit Inlets. The average annual precipitation at Swanson Bay is 180 inches, but the maximum has reached 280 inches. Lowe Inlet may be taken at about the same rainfall, but on travelling north and south the precipitation becomes less, the vicinity of Wright Sound being considerably drier.

The snowfall varies with the rainfall, those places with the maximum rainfall also having the maximum snowfall. The maximum rainfall occurs during the months of October, November, and December, and the minimum during July and August. This year, at Swanson Bay, there was no precipitation whatever for the first twenty-two days, and the weather was delightful during this time.

INDUSTRIES.

Lumbering, fishing, and mining are the only industries at present operating on the portion of the coast triangulated this year.

At Swanson Bay, on the east shore of Graham Reach, is the sawmill and pulp-mill of the Whalen Pulp and Paper Mills, Limited, cutting about 250,000 feet of lumber and 500 M. shingles daily. The pulp-mill shipped 10,500 tons of pulp in 1919. About 2,500 horse-power of hydro-electric power is developed from the creek flowing out of Yule Lake at Swanson Bay.

Swanson Bay is a "closed town," and has, besides the sawmill and pulp-mill, a store, post-office, and wireless telegraph station. A large part of the logs used at Swanson Bay are brought in Davis rafts from Queen Charlotte Islands, but the Whalen Pulp and Paper Mills, Limited, hold the greater part of the best timber and pulp leases in the area triangulated, as well as large areas in the vicinity of Gardner Canal. The best quality of lumber is loaded directly into box cars at Swanson Bay, the cars being run on to car-ferries holding nine cars each and towed to Prince Rupert.

Butedale Cannery, owned by the Western Packers, and Lowe Inlet Cannery, owned by the British Columbia Packers' Association, are the only salmon-canneries. At Butedale, on Fraser Reach, there is an ice-making plant as well as a cannery, and a large number of halibut-boats call here on their way north and south for bait and ice, as it is in a convenient position for the Vancouver and Seattle boats. The Western Packers are also building a cannery at Crab Bay, at the entrance to Gardner Canal.

Lowe Inlet is a smaller cannery at the head of Lowe Inlet, Grenville Channel. Both these canneries get all their salmon by means of drag and purse seines operating near the mouths of the larger creeks. No gill-nets are used. Practically all the unskilled labourers are either Indians or Orientals.

Mining.

The area triangulated lies, for the most part, along the western contact of the Coast batholith with the older sedimentary rocks, the rocks exposed being either white granite or highly metamorphosed sedimentary rocks in the form of schists. Many mineral claims have been staked and Crown-granted, especially at Swanson Bay, on Khutze, Aaltanash, and Klekane Inlets, and on Gribbell and Princess Royal Islands. No mines are producing in the immediate vicinity of the area triangulated, but the Tonopah-Belmont on Surf Inlet and the Drum Lummon Mines on Douglas Channel are only a few miles distant. There are several claims staked on Kumeolon Inlet for limestone, and limestone is mined on the Princess Royal shore, Graham Reach, 7 miles south of Swanson Bay, being shipped to the latter place for use in the manufacture of sulphide pulp.

Magnetite of a good quality is seen at Stuart anchorage on Grenville Channel, and the behaviour of the magnetic needle on parts of Gil Island go to show that there is a considerable quantity of magnetite here also.

A few miles south of Lowe Inlet, on Pitt Island, iron-staned bluffs are seen. They looked very tempting and would have been investigated had the season not been so far advanced. This district is very easy of access, no part being more than a few miles distant from tide water.

Game.

Coast deer are seen all along the coast, being more numerous on the outer low islands than on the mainland and high rough islands. They are often seen in the water, swimming across channels or inlets, and a 2-mile crossing is not too much for them. One black bear was seen swimming across Hiekish Narrows, one-half mile wide at that point.

Princess Royal and Gribbell Islands are the home of a species of white bear. They are the same size as the ordinary black bear, but are a distinct species. I am informed that they have been shot near the Kitsumgallum River, north of the Skeena.

A few geese nest on the low islands and the black Siwash ducks stay all the year round. The better varieties of duck, such as mallards, etc., do not seem to nest along the coast, but come down from the north to spend the winter along with large numbers of geese who have also nested north. No grouse were seen, but a few blue grouse were heard during June. Trout can be caught in practically all the creeks.

Of sea-life, quite a few whales were seen in the vicinity of Wright Sound, but they seem to avoid the main steamboat channels and make off when approached by small boats.

Clams are found on all beaches, except those near the mouths of large creeks at the head of inlets.

I have, etc.,

A. E. Wright, B.C.L.S.

CONNECTION AND RECONNAISSANCE SURVEY, OOTSA LAKE TO DEAN CHANNEL.

BY F. C. SWANNELL.

January 13th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit herewith report on the country mapped in connection with a triangulation connecting the 93-Mile post on the 53rd parallel north as established by R. P. Bishop, B.C.L.S., with a triangulation made by J. T. Underhill, B.C.L.S., up Dean Channel.

To facilitate reference I shall treat separately the area adjacent to each of the large lakes east of the Coast Range, and finish with the valley of the Kimsquit River, which we followed down to Dean Channel.

Leaving my base at Ootsa Lake on June 10th, I spent June and the most of July mapping Whitesail Lake. The remainder of July and half of August were spent in triangulation from the end of the 53rd parallel survey westward along Eutsuk Lake. The Dominion Geological Survey having a party on this lake, they undertook to make a plane table micrometer traverse of the shore-line and minor topography, leaving me free to extend the main triangulation. This arrangement will result in a topographic map more detailed and accurate than either party could have made unaided.

The last fortnight in August was spent in cutting trail, packing supplies, and triangulating through Smaby Pass to the Kimsquit Valley. During September we traversed 30 miles down the Kimsquit Valley to its mouth, and finishing the season's work by triangulating Dean Channel to the end of Mr. Underhill's work at the mouth of Dean River.

WHITESAIL LAKE.

This lake is 29 miles long, averaging 1½ miles in width, its greatest width being 2¾ miles at 12 miles up from its outlet. The lake is subject to violent winds, almost invariably from the mountain passes to the west. The Indians have named it Whitesail (i.e., Whitecap) Lake on this account.

There is no agricultural land on this lake, but along the south shore from Portage Bay to the outlet the country is well timbered, spruce predominating. This timbered area extends back, as far as could be observed, to the low summits of the hill-range north of the St. Thomas Lake country. Around the outlet and Whitesail River the country is absolutely worthless, being broken gravel benches and rocky hills, largely burnt over, such timber as has escaped the fire being scrub.

To the north of the lake is an isolated mountain range with rounded grassy summits, there being scattered areas of good timber on the lower slopes. The western half of the south shore rises very steeply, in places precipitously, the main Coast Range thrusting a lofty spur to the east, the most conspicuous peak being Mount Chicamon, 7,000 feet, a perfect cone which is an excellent landmark from every direction, and which I therefore utilized as the main triangulation point for the entire survey.

A narrow gap of half a mile leads from the west of the lake into Little Whitesail Lake, 3 miles long, T-shaped, and hemmed in by high mountains. North from here a wide trough valley runs through to Blue Lake. The stream descending this valley, which passes through a canyon about half a mile above Little Whitesail Lake, is joined by a fork from the west draining Coles Lake, a beautiful, deeply indented, island-dotted lake 8 miles long.

EUTSUK LAKE.

At the bottom of Portage Bay, 12 miles from the outlet of Whitesail Lake, a portage of 800 paces leads to a small beaver-lake 70 feet higher than Whitesail Lake. Crossing this lake a further portage of 900 paces brings one to St. Thomas Bay, Eutsuk Lake.

Eutsuk Lake lies 115 feet higher than Whitesail Lake and is 2,840 feet above sea-level. It is 50 miles long, the westerly 15 miles being hemmed in by mountains on all sides. To the south particularly the scenery is splendid, the glaciers on Mount Haven stretching almost to lake-level. The mountains hug the shore for half the length of the lake, Atna Bay lying completely within them.

From the peninsula at the entrance to St. Thomas Bay low broken hills run south-easterly, at first hugging the shore closely. North of these hills is a wide area of undulating country

occupied by the St. Thomas Lakes and draining into the bay of the same name. The only agricultural land of the entire region is to be found here. The easterly 15 miles of Eutsuk Lake has been surveyed into sections, but most is gravelly jack-pine country. Fifteen miles from the outlet, behind a long sandy beach, lie several sections of meadow traversed by a sinuous beaver-dammed creek. Unfortunately these, the only meadows observed along the lake, are too wet and cut up by beaver-ponds to be of much value.

A short stream entering the foot of Atna Bay links to it Pondesy Lake, which is little higher than Eutsuk Lake, as during high water in the latter lake it backs up until there is only one riffle between the lakes. Pondesy Lake is reported to be 10 miles long and lies entirely in the mountains.

Adjacent to the western end of Eutsuk is Surel Lake, 170 feet higher altitude, entirely mountain-walled and glacier-fed. The stream draining it is 40 feet wide, very rapid, the last 90 feet of drop being in two cascades at its mouth. It is the main feeder of Eutsuk Lake.

Smaby Pass.

At the extreme south-westerly end of Eutsuk a low moraine ridge banks back Musclow Lake, which is 95 feet higher than Eutsuk. The creek joining the lakes is not navigable, but an old Indian portage exists.

Musclow (Little Eutsuk) Lake is a rough oblong 2 miles north and south by three-quarters of a mile wide. Its water is greenish, being glacier-fed. From its south end we cut a mile of trail following upwards a shallow creek to Cosgrove (Summit) Lake, 3,020 feet. We got our canoes into this lake, which lies between steep mountains, and is 1¼ miles long. An old Siwash trail formerly ran from here to the Kimsquit River, the Indians formerly hunting on Eutsuk Lake having brought their winter's supply of salmon in by this route.

Not having been used for over fifty years, the trail can hardly be traced, and we cut 12 miles of new trail, following the old blazes wherever traceable. One mile south of Cosgrove Lake is the summit of the pass, 3,100 feet, and shortly beyond this we reached a large creek running south-west. I have named this Smaby Creek after Mark Smaby (he and the other three timber-cruisers being the first white men to penetrate from the Coast to the Interior by this route). Smaby Creek issues directly from under the huge glacier on Mount Smaby as a torrent 15 feet wide and 1 foot deep. From 2½ miles it foams down a wide flood-bed strewn with glacier detritus; then the valley narrows and the creek enters a deep gorge, from which it only emerges into the main Kimsquit Valley 6 miles farther, the total fall to this point being 2,300 feet.

The canyon is cut along a continuous mountain-wall to the north-west, the mountain-slopes being very steep and bluffy, with numerous rock-slides. There is no possible route for a trail in the gorge. However, by keeping well back from the gorge we were able to get a fair route for our trail high up along the southern mountain-slopes, following a string of swampy side-hill alpine meadows.

At Mile 8 from Cosgrove Lake the benches play out, and a bad crossing over a torrent is followed by a difficult bit of steep side-hill under bluffs, with Smaby Creek some 400 feet directly below in a box canyon. At Mile 9½ we faced a very steep descent of 2,200 feet in 1¼ miles down a heavily timbered tongue to the debouchure of Smaby Creek into the main Kimsquit Valley. This 1¼ miles is very bad, but the only possible route down the mountain wall. The tongue is flanked on one side by the gorge; on the other side by precipices, crags, and tremendous rock-slides, leaving no width in which to ease the grade of the trail by zigzagging. This last 1¼ miles is so bad that to climb it light and descend with a 50-lb. pack is a hard day's work.

Kimsquit Valley.

Smaby Creek, now largely augmented in volume, after issuing from the gorge flows south-west and then south-east for 2½ miles and joins the main Kimsquit, whose valley is here 4 miles wide, the river swift and full of drift-piles, being 100 feet wide and 3 feet deep. Two and a half miles up-stream it forks, the larger branch coming in from the west and heading at about 7 miles above Smaby Creek in a lake reported to be 6 miles long. The North Fork hugs the western side of a broad heavily timbered valley, which turns sharply west 6 or 7 miles up. Three-quarters of a mile below the mouth of Smaby Creek the main river receives Glacier Creek, a torrent heading only 2 miles away in large glaciers overhanging the valley. In June, however, this

must carry a vast amount of water, as its boulder-strewn flood-bed is a quarter of a mile wide, and the Kimsquit River for 2 miles below is cut into numerous channels by bars of glacial detritus from this creek.

Two miles down from the mouth of Glacier Creek the river runs close below the slides and bluffs of the eastern mountain-wall; then runs a mile south towards the western valley-rim, enclosing between itself and glacier creek a large flat, mostly open beaver meadow with some muskeg, this whole flat having at one time or another been formed by the continually shifting bed of Glacier Creek. The altitude here is 700 feet above sea-level.

Impinging from the western mountain-slope of the valley, the Kimsquit runs south-east for 6 miles, the valley narrowing until at a trapper's cabin 19 miles from salt water by trail the river is hard against the mountains on the west, and the bottom land, subject to rapid erosion, confined to flats between river-loops. Above the cabin the river is 90 feet wide, deep, and very swift. Rock-outcrops appear and a short distance below boulder-strewn rapids.

GEORGE CREEK.

At this same point the first affluent to penetrate the eastern valley-wall cuts through as a 30-foot torrent. This creek penetrates deeply into the Coast Range and heads in lakes at about 4,500 feet altitude within 5 miles of Eutsuk Lake. Its upper waters were mapped from Mount Cosgrove. The valley is very deep and narrow, but would give a better grade to the interior than Smaby Pass. No trail exists up this valley. Below George Creek for 8 miles the Kimsquit has frequent boulder-strewn rapids and the valley is narrow. The next large creek to break through within the Coast Range now enters. We are now by river 8 miles from tide-water.

DONALD VALLEY.

Five miles from tide-water a large creek enters the Kimsquit from the north, occupying a deep, heavily timbered valley which parallels the Kimsquit Valley for 12 miles, being separated by a long mountain, reaching its highest point in the lofty mountains from whose glaciers Glacier Creek emerges. From salt water this valley would be mistaken for that of the Kimsquit, as it lies in apparent continuation of the lower part of the latter. The creek occupying it is at the trail crossing 50 feet wide and 18 inches deep at its lowest stage. This valley is reported to be the shortest winter route to the Upper Kimsquit.

Between Donald Creek and the mouth of the Kimsquit the river is broken into numerous channels full of bars and sloughs, and during high water most of the bottom is flooded, not alone by the Kimsquit water, but by snow-water from several large creeks in deep valleys which enter the Kimsquit by a mass of flood-channels about 3 miles up.

The Kimsquit Valley for its entire length is heavily timbered, excepting for large beaver-swamps near Glacier Creek and the flood-bed lands at the creek deltas 3 miles up. The soil is poor as far as the forks and consists in the valley-bottom of coarse sands overlying glacial drift. The side-hills are sandy loam mixed with loose rock overlying old rock-slides. The beaver meadows are only a superficial layer of muck and peat overlying gravel and drift. The valley cannot be said to have any agricultural possibilities, although above the forks the soil improves greatly.

MEANS OF ACCESS.

The Whitesail and Eutsuk Lake region is readily entered from Ootsa Lake by way of Long Lake and Whitesail River, only the upper 3 miles of which is swift water. There are a few nasty turns which could be rendered safe by cutting out projecting drift-logs. An alternative water route from Natalkuz Lake has only one real obstacle in the shape of the Tetachuck cascades and rapids, the short canyon at the outlet of Eutsuk Lake being easily negotiated. An old trail runs up the Kimsquit Valley, but is much obstructed by fallen timber. The trail we cut across Smaby Pass is passable, but the grade out of the valley very steep, and horses could not possibly be taken in over any of these trails.

MINING.

Nothing need be said on this subject, as the Geological Survey had a party on Eutsuk Lake all summer, and the prospects on Chicamon Mountain have been reported on by the Provincial Bureau of Mines. Smaby Pass and the Upper Kimsquit have never been prospected at all, and the possibilities are excellent here, as we noted several good showings of mineralized rock in

the canyon of Smaby Creek and on Musclow Mountain. Assessment-work is being done on claims near the mouth of the Kimsquit.

Farming.

There is no settlement in this entire area either side of the Coast Range. There is no agricultural land bordering on the large lakes, although a large interior area was favourably reported on by J. M. Rolston, B.C.L.S., in the St. Thomas Lake basin. The soil above the forks of the Kimsquit is good, but the timber is heavy.

Timber.

The Kimsquit Valley has been cruised by the Forest Branch this season, and so need not be referred to in this connection. On Whitesail Lake there is good timber across to the St. Thomas Valley Divide, as well as smaller areas north of the lake. Most of the timber around this lake is very poor balsam, with much windfall and dead timber accounted for by the rocky soil. There is very little really good timber on Eutsuk Lake, that on the eastern portion being mainly scrub jack-pine. There is good timber in Smaby Pass, particularly near Cosgrove Lake.

Climate.

The season was exceptionally late, the snow lying in the mountains until late in July. The maximum and minimum temperatures were read daily. In July, in the lake regions, the averages were maximum 71° F., minimum 45°; August, 64° and 43°; in September, in the Kimsquit Valley, 58° and 43°. An entire absence of summer frost, even high in the mountains, was most remarkable. The rainfall was normal in the lake region. In the Kimsquit Valley during September and October there was rarely a day without rain. The change to the wet Coast climate was very abrupt, obtaining directly we crossed the divide.

Game.

Goat were plentiful in the lake region and caribou fairly so in the high mountains. There seem to be no deer, except up Cummings Creek on Whitesail Lake. A few moose are found. There was no small game such as grouse, probably due to the abnormal snowfall last winter. Grizzly and black bear were plentiful. Excellent fishing was had below the cascades on Surel River, but the trout on Eutsuk and Whitesail Lakes did not readily take the troll. There was an entire absence of game in the Kimsquit Valley, except for bear and goat. Never have I seen the former more plentiful, the bars being tracked and criss-crossed with grizzly-tracks and the thickets full of their trails. The Kimsquit is a great salmon-river.

I have, etc.,

F. C. Swannell, B.C.L.S.

VICINITY OF BARKLEY AND CLAYOQUOT SOUNDS.

By F. E. Leach.

Victoria, B.C., January 29th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on surveys made by me, pursuant to your instructions, on the west coast of Vancouver Island in the vicinities of Barkley and Clayoquot Sounds:—

The first locality visited was Pipestem Inlet, a narrow body of water to the east of Toquart Harbour, at the northern side of Barkley Sound. Here there is no level land, the mountains rising from the sea-level in long regular ridges heavily covered with timber. The principal varieties are cedar and hemlock, but there is also a very considerable quantity of fir and white pine as well. At the head of Pipestem Inlet is a low pass leading to Effingham Inlet, which is followed by the Government telegraph-line and trail. This trail traverses a fine stand of timber throughout its length.

The head of Pipestem Inlet appears to offer many advantages as a sawmill-site. There is sufficient level ground for buildings and yards, a well-protected booming-ground, deep water communications with Barkley Sound, a large supply of standing timber easily accessible, and an ample supply of fresh water in Misty Creek.

ISLANDS IN BARKLEY SOUND.

The survey of a large number of islands in Barkley Sound was next proceeded with. These have in general the same characteristics, which are somewhat modified according as the islands approach to or are distant from the open ocean. On the former, especially on those areas more exposed to the ocean winds, spruce forms the predominating timber. This is often gnarled and twisted to an extraordinary extent. Farther up the sound there is more hemlock and cedar, with a few white pine and yew.

On all these islands there is a dense and almost impenetrable undergrowth of salal, wineberry, and other shrubs. On the larger islands this underbrush may partially thin out towards the centre, but in no place is there any easy going.

The soil consists largely of decayed vegetable matter and black loam overlying rock or gravel subsoil. In the few places that have been cultivated among these islands excellent results have been obtained, but at present there is no activity in that direction.

It was thought that the development of the fishing industry might lead to the use of a number of these islands as fishermen's homes. Sufficient ground might be cleared to supply the necessary vegetables for a family, and at the same time the location would be convenient to the fishing-grounds. In that new development of fishing, the trolling for salmon from power-launches, the custom is for the smaller boats to operate comparatively close to shore, or even among the islands. They leave harbour each morning about dawn and return in the afternoon. On stormy days they do not as a rule operate. Many of these islands afford perfectly secure anchorage for small boats, especially during the summer months, when fishing is carried on.

The smaller islands do not appear to have any permanent water-supply, so that it would be advisable for any one contemplating taking up an island to first ascertain whether he can secure a supply by sinking a well. In the winter months an ample supply is generally available from the rainfall, but there are often long spells of dry weather between May and October.

INDUSTRIES.

There are only two principal industries carried on upon this part of the west coast. These are fishing and lumbering. Farming is as a rule undertaken only as a side-line and to supply local needs. The cost of clearing land is so heavy that the returns obtained are not generally considered commensurate with the effort required to produce them.

A number of metal-mining ventures have been undertaken from time to time at different points, but hitherto without any permanent success.

In the fishing industry probably the largest number of people are employed in trolling for salmon. This can be carried on by one man in a boat of about 25 to 30 feet. Sometimes larger boats are employed with several men on board. These can fish farther off-shore and remain out longer. Returns are very uncertain, as there is a great variation in season's and also in daily catches. Others fish for halibut off the banks or gill-net salmon in the proper season. The catching of herring and pilchard is mostly carried on by the larger companies, who have facilities for freezing the catch if it is to be used for bait, or for salting or canning it. A considerable number of Orientals are engaged both in trolling in their own boats and as employees of the canneries.

The lumbering industry has been but little developed as yet on this part of the west coast. The logs taken out on Barkley Sound have to be towed to Port Alberni for disposition. At Mosquito Harbour, Clayoquot Sound, there stands a large and completely equipped sawmill which has not been operated for a good many years.

Almost the whole of the area in the Barkley Sound and Clayoquot Sound Districts is held under timber licences, except for a narrow fringe along the ocean front. All the hills along these inlets and the more level lands along their tributary valleys are covered with a fine stand of cedar and hemlock timber, while along the river-bottoms are found large areas of spruce. All this timber forms a reserve which will undoubtedly be developed when the need arises.

BEDWELL RIVER.

A traverse was carried up Bedwell River, or, as it is locally called, "Bear River," from its mouth to the summit of one of its forks. Some years ago a mining company undertook to build a wagon-road up this river to its property somewhere near headwaters. This road was built and used for a distance of about 8 miles. Two large and well-formed truss bridges were built

across the river. Smaller bridges were built where necessary across tributary streams and the road was graded or corduroyed as circumstances required. Beyond this a good pack-tail was cut out and graded for 2 miles, and from there a blazed line led for several miles farther. Substantial log houses were built at intervals, and the greater part of the materials for building an aerial tramway were unloaded on the beach. On the outbreak of war in 1914 all this was abandoned and nothing more has been done since then. The road is growing up in alders and salmon-berries; some of the bridges have been washed out and everything of value not too heavy to be carried away has been carried away.

There is no land along the Bedwell River that is suitable for farming, the whole valley being heavily timbered with cedar, hemlock, fir, and spruce. The river does not appear to be suitable for log-driving, but the valley might be conveniently logged by means of a logging-railroad. The flats at the mouth of the river would make a good mill-site.

Bedwell Sound.

A triangulation was carried from the head of Bedwell Sound through Race Narrows to the head of Warn Bay. All this country is marked by the same features that characterize most of these inlets—very deep water, steep rock shores without beaches, and high, heavily wooded ridges. There is no land anywhere in this area that is suited for pre-emption.

Tofino Inlet.

This inlet is in all respects similar to the above-described Bedwell Sound.

Game.

There is but little game to be found in the area covered. A few black bear and deer in the valleys and some ducks in Clayoquot Sound are about all.

I have, etc.,
F. E. Leach, B.C.L.S.

VICINITY OF FISHERMAN BAY AND GEORGIE LAKE, RUPERT DISTRICT.

By J. H. Gray.

January 27th, 1921.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

Sir,—I have the honour to submit the following report on the survey of certain parcels of land in Rupert District:—

After arriving at Fisherman Bay by launch from Fort Hardy on September 7th the first lot surveyed was the S.E. ¼ of S.E. ¼ of Section 25, Township 40. This 40 acres is covered by a tree-growth of scattered cypress, mostly dead, ranging from 12 to 30 inches in diameter; here and there a good-sized cedar and a fairly thick growth of small cedar and pine; no timber values. The land is good, a gravelly clay loam, but rough and lumpy, wet in pools, and for most part moss-covered.

The old Danish school-house, around which an acre was surveyed, is a frame building in poor repair. It is well situated for school purposes, standing on level ground at the apex of a slight elevation. A wagon-road in fair repair so far as seen extends from Fisherman Bay for some miles southerly. This road bounds the Government reserve on the east, while a cross-road leading, I think, to the west coast extends along its south boundary. Several houses apparently untenanted and uncared for were noticed along the mile of road walked.

At Fisherman Bay is the post-office and a small store. A weekly mail service is maintained with Shushartie, where the Union Line steamers call. This mail service is carried on nearly altogether by motor-boat, always at some risk and at great danger in the winter months. A trail follows the coast-line and there is telephone communication with Shushartie and other points.

Fisherman Bay is but a shallow indentation in the coast-line, and while sheltered from the south-east, it is open to the full sweep of the Pacific when north-westerly winds prevail.

Lot 1592.

Lot 1592 is a tract of 280 acres lying half a mile north of the south boundary of shore of Nigel Island. The only landing approximate is at a small cove, well land-locked, on Lot 1014, from which access to Lot 1592 for other than a foot-trail would be attended with difficulty. The timber covering consists of dead cypress, cedar, hemlock, and pine, ranging from 10 to 30 inches in diameter, standing close in some localities, but I should scarcely consider sufficient live timber would be found to create timber value, especially considering the very broken surface formation. Cedar and hemlock thicket abounds and heavy salal is the rule.

A continuous succession of rocky-gravel ridges and small isolated hills constitute the surface, reaching on the north boundary an elevation of 200 feet above the general level. Many narrow swampy depressions or streaks of good land, for the most part drainable, ramify between these ridges and mounds; the more extensive of these will be approximately shown on the plan to be submitted. At the present time I think their area would not amount to more than 10 per cent. of the acreage surveyed.

Two lakes were encountered on the east boundary, the first a quarter of a mile north, the other at the north-east corner, both with rocky shores. The water area would not exceed 21 acres. Our experience on the work at these lakes (we had to cross the last and larger) emphasized the fact that cypress is no raft-timber.

A valley falling and extending northerly from the east end of the lake at north-east corner of Lot 1592 was examined for a mile, and although more favourable than the ground we were engaged upon, I did not consider it justified survey. This was the only outside area that engaged my attention.

West Half of Section 35 and East Half of East Half of Section 34, Township 38.

The above tract contains P.R. 253, the unoccupied S.W. ¼ of Section 35, and P.R. 698, lying in the valleys of the two branches of the San Josef River, some 3½ miles south-west of Holberg, at the head of the West Arm of Quatsino Sound.

The road-bridge across Spruce Creek being "down" at the time we arrived, by way of which it would seem the locality of our work had been usually reached, and further disappointed in not being able to procure horses, I was attracted by trail shown on the departmental map which appeared to cut down the distance by at least one-half. It was adopted for our purpose. Although more circuitous than anticipated and required cleaning out, etc., I am assured that it served us better than the more northerly and longer route. Locally known as the Macaroni Trail, it starts from the mouth of 1-Mile Creek, magnetic south from end of Holberg Wharf.

P.R. 698, Section 34.

This area for the most part occupies a mountain-side, being the westerly slope of the valley of the West Fork of the San Josef River. The area is for the most part covered with a good growth of standing timber—cedar, hemlock, and spruce, 2 to 3 feet in diameter, with smaller growth. Salmon-berry brush abounds on the flat and salal on the hillside. Streaks of dead windfall are found running through this timber, in which nothing of value is left standing; generally heavy windfall is found everywhere.

Small patches of arable land are found at intervals throughout a rock and gravel side-hill, down which flow many streams of varied dimension. An exception to this is found in the north-east corner, on a flat bench of alluvial soil some 30 feet above the river, extending 10 chains west and 20 south, in each case to foot of the hill. The pre-emptor, A. D. O'Kelley, has his cabin in this corner, where he has cleared and made a garden.

P.R. 253, Section 35.

The main San Josef River flows through the north-east corner and continues approximately to the east boundary for a quarter of a mile, while the West Fork of same stream traverses the quarter through its centre. These streams, to the extent seen, average slightly over and under 1 chain in width respectively. They flow in a narrow trough 30 to 50 feet deep, which, generally speaking, is filled with an inextricable collection of log-jam, windfall, and willow thicket. The easterly or main branch flows much the greater volume.

The north half of this quarter-section is good land; that area of this (about one-half) lying west of the West Fork is well timbered, similar in all respects to the north-east corner of P.R. 698; that portion between the two rivers is covered with small timber, principally hemlock,

with large spruce and hemlock here and there. Very bad windfall extends throughout, excepting a strip of about 8 chains wide along the north boundary.

The south half is gravel and rocky, covered with high windfall from 5 to 25 feet in height, amongst which hemlock thicket for the most part grows. Groves of good-sized standing timber are to be found at intervals. The pre-emptor, who is absent, has built his cabin at about centre of quarter-section, 10 chains south of north boundary; here is a clearing of 5 acres, remains of a garden, and some ditching.

South-west Quarter of Section 35.

Excepting some 30 acres, lying along the south boundary, between two large feeders of the West Fork of the San Josef, of moss-covered swampy land, falling northerly and which is clear of the general heavy windfall and heavy tree-growth, there is no arable land on this quarter-section. The remainder is rough, gravelly, and rocky, covered with heavy windfall, in which, besides the prevailing hemlock thicket, occur scattered groves of good standing timber.

Apparently abandoned cabins were noticed on the N.E. ¼ of Section 35, Township 38, and on the two quarter-lots comprising the E. ½ of Section 2, Township 37, together with considerable clearing and one-time garden. These places appeared to offer greater settlement inducements than those I surveyed, especially for stock.

I am of opinion that in the valley of the main San Josef better country is to be found than the pre-emptions surveyed; in fact, generally to the east of our easterly line of work.

Vicinity of Georgie Lake.

West Half of Section 6 and South-west Quarter of Section 7, Township 8.

This tract comprises respectively P.R. 1612, P.R. 1558, and P.R. 1450, lying some 8 miles north-westerly from Port Hardy, in what is locally known as the Georgie Lake country. There are two lines of approach to this locality either to follow the Kains Lake Trail, which takes off in a westerly direction from the wagon-road boat-landing opposite Port Hardy for about 5 miles, from which point a cross-trail runs northerly, which followed for a good 2 miles brings you to the Jenkinson cabin on south-west of Section 6. The alternative is by way of a trail along a creek draining Georgie Lake, which reaches the coast 8 miles northerly from Port Hardy. Although the pack would be double the distance, I decided on the Kains Lake route and made headquarters in the Jenkinson cabin, since the shorter way was contingent upon finding a boat on the lake and fine weather for landing at so exposed a point. The Kains Lake Trail is good, a semi-wagon road; the cross-trail a mere footpath. The log crossing at Tsulquate River is wide and high; we were able, however, to rig a satisfactory life-line after the snow came down.

P.R. 1558, Section 6, Township 8.

This is a fairly good tract of land, undulating east and west and falling northerly in same manner towards Georgie Lake. The soil is a good clay loam, for the most part requiring drainage and covered with a growth of cedar, cypress, and hemlock, reaching a maximum diameter of 14 inches, with salal-brush; there are no timber values. The pre-emptor has built his cabin about one-third from the south-west corner easterly and close to his south boundary. His improvements consist of 12 acres cleared and partly stumped, nearly an acre of garden which is picket-fenced on three sides and through which he has laid down stone-paved walks, besides a large amount of excellent ditching, particulars of which, with sketch-plan, will be submitted.

P.R. 1612, lying north of P.R. 1558, is similar in all respects thereto. No occupant was found here, nor could I learn of his whereabouts. I was informed there is a small cabin on the ground, but it was not seen.

P.R. 1450, S.W. ¼ of Section 7, Township 8, lies north of the quarter-section last described and abutting on Georgie Lake, which forms its north boundary. As the lake is approached, in fact after leaving Section 6, the timber-growth becomes heavier, although not representing commercial values, the undulations steeper, marking a general greater roughness throughout, which is reflected in the soil changing to gravel and rock, with moss-covered surface bearing heavy salal. From all I could learn there are no improvements on this quarter-section.

The easterly end of Georgie Lake, which extends 30 chains farther east than now shown, lies in a depression 200 feet deep; this narrow valley seems to continue easterly from end of lake. The south slopes, covered with bad windfall, are timbered to the, for most part, rocky shore-line.

The height of land between Tsulquate River and Georgie Lake was made by aneroid 750 feet above sea-level, Jenkinson's cabin (P.R. 1558) 700 feet and the lake 600 feet below this; the barometer, however, was not dependable. I formed the opinion from observation, afterwards qualified by Mr. Jenkinson, that the E. ½ of Section 6 is good land, quite on a par with that surveyed.

Deer, judging from signs, are everywhere plentiful; a few were seen, but none killed; wild geese, duck and grouse, fairly so.

A general complaint is lack of communication. Stock would appear to present, at least, an alleviation of the situation. Wagon-roads cannot be here constructed, except at heavy outlay; whereas with good cattle-trails to steamer-points, live stock should be manipulated to create an asset that would materially assist during the growing period. Stock do well hereabouts; and pertaining to the above, a settler gave me the information that hogs thrive on the roots of salal. The fresh pork we had from him emphasized excellent results and there should be no shortage of feed.

Our weather throughout was unfavourable. September and first week in October were heavily and continuously wet. From then to end of November, including ten days of fine and frosty weather in that month, it was about one-half fine, although showers every day was the rule. December was extremely bad; snow fell on the 4th, which by the 12th had reached a depth of from 14 to 20 inches, according to locality. The snowstorm of the 12th was accompanied with sharp thunder and lightning. Up to the time we left, morning of December 18th, the weather had been a succession of snow, sleet, and rain storms. It was a boisterous season, however, generally throughout the Coast districts.

I have, etc.,
J. H. GRAY, B.C.L.S.

PHOTO-GEOGRAPHICAL SURVEY, UPPER NICOLA VALLEY, KAMLOOPS DIVISION OF YALE DISTRICT.

BY R. D. MCCAW.

VICTORIA, B.C., November 29th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—Your instructions under date of July 30th placed the area to be covered by photo-topographical surveys in the easterly portion of the watershed of the Nicola River, adjoining my previous work in the Okanagan Valley. The practice of previous years was to be followed in carrying on the work, the intention being to cover as much ground as possible south and west.

Before going into details regarding my actual field operations, it might be well to state that the photo-topographical equipment which I used this year contained two new surveying cameras with holders and cases complete. These instruments were constructed in Victoria under my supervision after the design of the camera used by the Surveys Branch, Ottawa. Dr. Deville, Surveyor-General of Dominion Lands, very kindly loaned one of his cameras for the purpose of using it as a pattern. The lenses used are Bausch and Lomb-Tessar anastigmats and were manufactured by the Bausch & Lomb Optical Company. A 3K (yellow) ray filter is used with the lens, being one of a series used with Wratten & Wainwright panchromatic plates. These plates were used this season for the first time since 1915. The results obtained are in every way more satisfactory than with the plates used formerly. The season's field-work gave the new cameras a rigid test, and, as far as manipulation and general results are concerned, are quite all that could be desired. One improvement which may be added is in the form of a better filter made from optically flat glass. This is for the purpose of dispensing with any possible distortion. The filters used are made from selected glass, but are not optical flats.

Actual field-work extended over a period of about two months and a half, some 38 dozen exposures being made during this time. The controlling triangulation was carried over from the Okanagan Valley, using stations of the Geological Survey of Canada. Bad weather conditions in September and October caused some readings to be very unsatisfactory, insomuch that I cannot give a balanced triangulation sheet this year, although it will not interfere with the topographical sheet. Two camera parties were usually operated, although a good deal of my

time was taken up with the system of control alone. Pack-horses were used for moving about, as the greater part of the area covered was away from highways.

Season's Operations.

The party was organized at Merritt at the beginning of August and the first camp was located north of Chapperon Lake on August 4th. Signals were erected in that locality and some camera-work done at once. My assistant, C. H. Douglas, took charge of the area while I was absent erecting main triangulation signals. I went first to the Geological Survey Station on Gottfriedsen Mountain and placed new cotton upon the framework which was still standing. The trip was made by way of the settlers' road up Spahomin Creek to Hatheume Lake, then by trail to the top of the mountain. From this point I located other controlling positions for further signals, and on the return trip placed a signal on one of these—namely, the south spur of Mount Hamilton. This feature is a high isolated timbered ridge west of Douglas Lake. An old station of the Geological Survey was found on the north spur of this mountain. On August 13th camp was moved up Sucker Creek, and for the next ten days we were engaged upon the watershed of that stream, working east to the Okanagan Divide and connecting with the area mapped in 1917. A main station was occupied and a signal erected on Tahaetkun Mountain (Baldy Mountain). This is the highest feature in the locality, the altitude being about 6,600 feet. In 1917 I occupied the easterly spur of this mountain. This mountain is really the main source of Sucker Creek, which flows in a westerly direction between two high ridges which gradually drop to the open hills near Chapperon Lake. The creek is tributary to Chapperon Lake and is more or less a sluggish stream, interrupted in its upper portion at frequent intervals with beaver-swamps. A couple of small lakes also exist en route. The timbered areas adjoining are totally different on each side of the creek. To the north open fir in the lower and open jack-pine in the higher elevations is the order, except in the near vicinity of Tahaetkun Mountain, where windfalls are very thick with thick growth of spruce and jack-pine. The upper portion of the mountain has much open area. South of Sucker Creek the growth is a dense tangle of jack-pine and spruce, usually with windfalls, and has practically no grazing. North of the creek there is a good growth of pine-grass and weeds.

From Sucker Creek we moved to the bend in the Nicola River at Lot 609, and until the end of August were working in that vicinity. We then moved camp up the next main creek south of Sucker Creek. This stream has its source near the headwaters of Shorts Creek (Okanagan side). The valley is very similar to that just described—namely, open timber and grazing north of the creek, while there is dense growth and no grazing to the south.

From September 6th to 27th we were engaged along the Nicola River and its tributaries east and north, above the junction of the stream just mentioned. This part of the country gradually flattens out into a comparatively level plateau, extending south to Penask Mountain and Culmination Point, taking in Penask and Hatheume Lakes, with many smaller lakes as well as various large and small meadows. This year we did not reach these areas with the photographic work on account of unfavourable weather conditions. As a rule there is a good distribution of pine-grass and weeds, except on some north slopes and in the higher elevations to the east. The lower slopes along the Nicola River have much open area in bunch-grass. Meadows and marshes occur on all streams above 4,000 feet and some are of large extent. The timber is usually jack-pine and the area exceedingly free from windfalls. In fact, large areas are quite park-like and a saddle-horse can travel in almost any direction. Higher elevations run into spruce and balsam, with windfalls quite common, while fir grows lower down the river. The high elevation of the plateau country renders it of no utility for farming, but the good growth of pine-grass and meadow-grass gives it fair value for grazing and wild hay. A large number of mineral prospects are scattered throughout the upper area and several samples of asbestos were picked up. On account of the flattening-out of the Upper Nicola country we were forced to use compass and barometer along the streams, as the prominences were not sufficient to control the topography.

On September 29th I left to get final readings at the Gottfriedsen Signal. My assistant was left in the vicinity of the east end of Douglas Lake to work in the open hills in that locality. My work at Gottfriedsen was spoiled by snow and rain, insomuch that I could not complete the readings I wished to get in the time at my disposal. I could take no photographs and had to leave it in order to reach Terrace Mountain, as it was necessary to occupy this station, and

weather conditions were not appearing very favourable. I left for Terrace Mountain on October 7th, and as the upper trails over the divide were very bad from wet weather I decided I could make better time by going via Merritt and Penticton by train and use any means I could arrange for to get up Okanagan Lake to Terrace Mountain, which rises 4 or 5 miles west of Short's Point. The third day after leaving Douglas Lake I took all the readings at Terrace, except a satisfactory one to Little White Mountain. The day cleared at noon and good sights were obtained. The next day stormy conditions commenced again, and until we broke camp there was considerable snow in the higher elevations.

Upon my return to Douglas Lake we carried on our surveys in the vicinity of that body of water. It had been my intention to remain in the field until the end of October, but bad weather conditions often made the open hills untenable and photographic work poor. I occupied my last main station on October 15th and 20th under most unfavourable conditions. Camp was broken up on October 21st and the outfit moved in to Merritt. The party was paid off the next day and I reached Victoria on the 24th.

GENERAL.

There is no doubt that the past season has been a poor one for photographic surveys in the south-central part of the Province. To begin with, the summer was late and the previous winter's snow lay far into the summer in altitudes that should have been free from it. Stormy weather extended into July. August came up bright and hot and smoke from forest fires was soon in evidence. Occasional rains held this somewhat in check. The hot, dry weather extended to about September 8th, and from that date rain fell every few days, often with snow in the higher altitudes and accompanied by low-hanging clouds. These conditions made camera-work difficult and higher triangulation-work almost impossible. Despite all of these circumstances the photographs obtained are exceptionally good, but the area covered is smaller than it otherwise would have been. Frosts set in near Douglas Lake early in October and were frequent until we left. The actual field-work extended from August 4th to October 20th, and during that time about twelve full days were lost through rain. When it was at all possible to get views we always occupied a station despite the weather.

The following stations were occupied during the season: Main triangulation stations, 4; photographic stations, 59; separate camera stations, 136. In addition, five connections were made to land-survey corners.

The area covered may be divided into two separate parts—the timbered portion and the open bunch-grass hills in the vicinity of Douglas and Chapperon Lakes. The timbered area extends east to the Okanagan Divide. The whole country is smaller of feature than the Okanagan and a greater number of camera stations becomes necessary, as well as some traverses.

Stock-raising is the one occupation in the district. The Douglas Lake Cattle Company has large holdings with headquarters at Douglas Lake. The home ranch is a splendidly equipped establishment and the wayfarer is always most hospitably received by the management. Large areas of bottom land are cultivated for hay and grain for winter-feeding the stock. With the exception of this company, the only other ranches in the area done this year are Indians and a few settlers near Hatheume and Penask Lakes.

The Douglas Lake country is not tapped by railroad, but splendid wagon-roads connect it with Nicola, Merritt, and Kamloops. Other highways radiate to Chapperon Lake, Grande Prairie, and Minnie Lake. The Douglas Lake Company has numerous private roads through its own holdings, the gently rolling nature of the country making choice of location comparatively easy.

Very little game was seen during the season, although deer seemed to be plentiful, and along the Nicola River black bear are quite numerous. Grouse are plentiful as a rule. Mountain-lions and lynx are fairly numerous in the back country, while coyotes are very numerous in the open country.

The enlargements from the negatives are almost complete and are showing far better results than I expected, despite the poor weather. Map-work is under way and the usual information will be given, except that the triangulation sheet will be omitted for the present.

I have, etc.,

R. D. McCAW, B.C.L.S.

PHOTO-TOPOGRAPHICAL SURVEY, ASHNOLA VALLEY, SIMILKAMEEN DIVISION OF YALE DISTRICT.

BY G. J. JACKSON.

VICTORIA, B.C., December 7th, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—I have the honour to submit the following report on the photo-topographical survey carried out by me in the Similkameen District during the past season:—

The area covered consisted of some 400 square miles, bounded on the south by the International Boundary, on the east by the Similkameen River, and on the north and west by the watershed of the Ashnola River, and was a continuation westward of the area covered by R. D. McCaw the previous season.

The nearest town to this area is Keremeos, where I made arrangements to get my supplies, mail, etc. This is reached in a day from Vancouver by means of the Kettle Valley Railway to Princeton and the Great Northern Railway down the Similkameen Valley to Keremeos.

The Ashnola River is of fair size and carries quite a volume of water even in the dry seasons. Its source is south of the International Boundary, which it crosses about 30 miles west of the Similkameen River; it then flows northerly for about 12 miles; then easterly for another 12, where it is joined from the south by Ewart Creek; and it then flows northerly for about 8 miles to the Similkameen River. Along its whole course it is joined by many small streams from both sides. The Similkameen from the mouth of the Ashnola flows easterly about 10 miles; then southerly to the boundary another 12 miles.

The valleys of the Ashnola and its tributaries are very narrow and heavily timbered. Rocky hills on both sides rise steeply from 2,000 to 3,000 feet above the river. There is practically no suitable land for agriculture, and although several pre-emptions have been taken up, none are occupied at present and very few have had any improvements done on them.

The Similkameen Valley from the mouth of the Ashnola to Keremeos is about a mile wide, but south of Keremeos it widens out to about 2 miles. This valley is well settled and, although dry, raises good crops with the aid of irrigation, and seems very prosperous. All varieties of fruit and vegetables and alfalfa do well. A large acreage is planted each year in tomatoes, and there is a cannery at Keremeos to take care of the crop.

There are good roads all through the Similkameen Valley and a Government-built trail up the Ashnola as far as Ewart Creek; also pack-trails up Ewart Creek and the Ashnola to the boundary.

The area south of the Ashnola between the Similkameen and Ewart Creek rises steeply from the valleys to an elevation of about 5,000 feet, then has a more gradual slope to the summits at about 8,500 feet. The valleys and side-hills are fairly well timbered to about 5,000 feet with fir, spruce, and black pine, and from 5,000 to timber-line, at about 6,500, with small spruce and black pine. In this section there are large areas of open side-hill covered with bunch-grass and other mountain grasses. Water is plentiful, making it a good summer pasture for stock. This summer about 2,500 sheep and 300 cattle were pasturing there. This area is badly cut up by creeks, all of which are in valleys or canyons 2,000 to 3,000 feet deep, making it a difficult country to get around in. There are several trails leading into it, all very steep. One up Susap Creek from the Similkameen River and another from near the forks of the Ashnola and Ewart Creek are the best.

The section between Ewart Creek and the Ashnola is very similar to the last, but for the most part more level on top. The highest peaks here are about 8,700 feet. This area is thickly timbered right to timber-line and has very little open grazing, but there is a heavy growth of timber-grass all through the timber, which should be sufficient for a large number of stock, but they would be difficult to keep track of, and so far no one has tried it. As there are no trails worthy of the name through this area, we were forced to cut about 15 miles of pack-trail. We also found the last 10 miles of trail up the Ashnola badly filled in by windfalls and had several days' clearing before we could use it.

For 10 miles west of the Similkameen and north of the Ashnola there are many open bunch-grass slopes, which are being used for pasture. Crater Mountain lies in this district, reaching

an altitude of 7,500 feet; along its slopes the pasture was particularly good and about 300 head of cattle were on it all summer. From Crater Mountain westward the country is thickly timbered and not suitable for grazing.

Game was plentiful throughout the whole area. Deer were everywhere, and in some sections we were seldom out of sight of some and often fifty to a hundred were seen in a day. On all the high ranges mountain-sheep were seen in fair numbers. The largest band consisted of thirty-five, but as many as sixty-five were seen in one day, amongst them some fine rams. Sheep have been protected for several years in this district, but in spite of that are getting fewer every year, partly due to their being too great a temptation to hunters, but chiefly because of the cougars, to whom they are an easy prey in winter. Bear, both black and brown, were occasionally seen, but they seem to be very scarce. Fur-bearing animals were scarce, but there are a few, chiefly marten, mink, beaver, and coyotes. Blue grouse were plentiful on the slopes and ptarmigan on the peaks, also a few willow-grouse and fool-hens in the valleys.

In the Ashnola, particularly from Ewart Creek up, trout were plentiful, but very small; none over 10 inches being caught. The small lakes throughout the district do not seem to contain trout, probably being at too great an altitude.

The past season was not particularly good for photographic work. It was a very late spring, as the snow did not get off the higher altitudes until after the middle of June. In the three months and a half we were in the field we had twenty days' rain and a lot of cloudy weather, particularly in June, July, and September. During the latter part of August we were troubled considerably by smoke from bush fires. During the season the following stations were occupied: Main triangulation stations, 6; main photographic stations, 114; separate camera stations, 123; land-ties made, 13. The topographical map of this area is now well under way. Triangulation, grazing, and timber maps will also be prepared.

I have, etc.,

G. J. JACKSON, B.C.L.S.

SURVEY OF THE BOUNDARY BETWEEN THE PROVINCES OF ALBERTA AND BRITISH COLUMBIA.

BY ARTHUR O. WHEELER.

December 31st, 1920.

J. E. Umbach, Esq.,
Surveyor-General, Victoria, B.C.

SIR,—The survey of the Interprovincial Boundary was conducted upon the same lines as in 1919—viz., R. W. Cautley, D.L.S. and A.L.S., Commissioner for the Dominion and for the Province of Alberta, was in charge of the survey of the 120th meridian of longitude where it forms the boundary, and A. O. Wheeler, D.L.S. and B.C.L.S., Commissioner for the Province of British Columbia, was in charge of the photo-topographical survey of the watershed of the main range of the Rocky Mountains where it forms the boundary, and of the mapping of the country adjacent to it.

INSTRUCTIONS.

In accordance with instructions received from the Surveyor-General of Dominion Lands, Mr. Cautley's division continued the survey of the 120th meridian southward from the north boundary of Township 73, the point at which it had been discontinued in 1919. In the programme of the survey a somewhat radical change was made: The distance from the north boundary of Township 73 to the intersection of the meridian with the summit of the Rocky Mountains was estimated at 93 miles. Owing to the nature of the country, consisting very largely of old brulé and windfall, and the difficulty of transporting material for the concrete monuments, it was considered advisable to spread the work over two seasons. The first was to be spent in cutting out the line, selecting the sites for the monuments, and transporting the material necessary to build them to the respective sites. In addition, it was required to make a topographical survey of the country adjacent to the meridian for a distance of 1½ miles on either side. The second season was to be spent in accurately fixing the positions of the monuments, in erecting the same, in precise chaining and levelling, and, generally speaking, in completing the survey of the said 93 miles of the boundary.

The topographical division was instructed to continue the survey and mapping of the watershed and vicinity northward from Fortress Lake and Pass, where it had been discontinued the previous season, to close up the gap between the starting-point and the point where the survey had been stopped in 1917 at Tonquin Pass, some 9 miles south of Yellowhead Pass.

SURVEY OPERATIONS.

Mr. Cautley's Division.

Mr. Cautley reports that he was only able to cut 43½ miles of the 93 miles he set out to do, and that the southerly extremity of the line cut is left at the top of a 600-foot high cut-bank on the north shore of the Wapiti River, and about 25 chains therefrom, being the site of Monument 66-5 at chainage 112.552 south from the north boundary of Township 66.

The disappointing result is due to two causes—namely, shortness of the working season and extraordinarily bad windfallen country. The shortness of the season was due: First, to the unusually late spring, which retarded all field operations this year; secondly, to the fact that his packers were unable to get through to Grande Prairie from Entrance with his horses owing to the flooded condition of the Smoky River Crossing, but were obliged to turn back when within 75 miles of Grande Prairie, and that the Edmonton, Dunvegan & British Columbia Railway system broke down at the time for more than two weeks, so that he was forced to sell his pack-train at Edmonton and purchase more horses at Grande Prairie, thereby losing ten days of the entire party's time; thirdly, to very bad weather conditions, which caused a loss of working-time this season considerably in excess of what is usually met with.

In regard to the nature of the country, more than 30 of the 43 miles cut lies through heavy brulé windfalls, piled up from 4 to 6 feet high and interwoven with scrub second growth, mostly jack-pine. This class of country extends for from 1 to 4 miles east of the line and, as far as Mr. Cautley was able to learn, for an indefinite distance to the west of it—certainly far beyond the limits of his exploration. Of the remaining 13 miles, only 6 or 7, on either side of the Red Willow River, were ordinarily good running, the remainder being through extensive muskegs surrounded by brulé ridges. His party was a fairly good one and he had from thirteen to seventeen men actually cutting line, but for days, and even weeks, at a time his progress was limited to 2 to 3 chains per day for each axeman or sawyer on the line; he himself should not have believed it possible that there was any extent of country in the North-west which could justify such a slow rate of progress prior to this season's work. The line had to be cut throughout, not only as an exceptionally good survey-line, cut 6 feet wide to the sky, but also as a good pack-trail, except across wet muskegs, in which case a circumventing trail had to be cut through the brulé. If there had been comparatively open country anywhere near the line it would have expedited the work to locate and cut a pack-trail through it apart from the line, but the whole country adjacent to the boundary is similar in character, besides which it is an unusual feature of the boundary survey that the pack-trail must necessarily touch the line at all monument-sites so that the monument material can be delivered at them.

The only supply source of gravel for concrete monuments discovered by the season's work was the Red Willow River, and thirty-three sites were supplied with gravel from it, including all sites in Townships 73, 72, 71, 70, 69, and the two most northerly sites in Township 68. A thin layer of coarse gravel was found on the top of the mud in Steeprock Creek and was supplied to some of the northerly sites, but the supply had to be supplemented in all cases by sand from Red Willow River. Eleven other sites were located, most of which will have to be filled from the Wapiti River when a crossing has been found and a trail cut to it.

The crossing of the Wapiti River is likely to present considerable difficulty from what little Mr. Cautley saw of it on the last day's work on the line—September 28th. The said date terminated a period of seventeen days in which there had been either rain or snow every day, including seven days and nights of continuous rain or snow, so that the river was very high. He estimated that the river on the above date was 160 feet wide, from 3 to 5 feet deep, and with a current of from 5 to 7 miles an hour; it runs in a deep, narrow valley, hemmed in closely on both sides by cut-banks from 400 to 900 feet high, and the bed is composed of large boulders.

The line will strike the Wapiti River at a sharp bend to the east and will apparently cross the river three times, in an up-stream direction, before finally leaving it. There is nothing but muskeg feed for horses anywhere near the line, and not much of that, while there do not seem to be any river-bottom lands along the Wapiti, and the half-breeds informed Mr. Cautley that there was no feed to the south.

TOPOGRAPHICAL DIVISION.

The topographical division organized at Banff, which place is best suited for preliminary tests to cameras and photographic plates, by which means the data for mapping is obtained. Owing to the large amount of snow fallen during the winter it was found impossible to send a pack-train to Fortress Lake, where work had been discontinued the previous season, over the trail as had been intended; consequently, on June 15th the party, horses, and outfit were sent by rail to Jasper, where they arrived on June 17th. The horses were delayed for four days in transit at Edson and did not arrive at Jasper until the 22nd. The party started for Fortress Lake on the 23rd and arrived there on the 27th. Travelling was slow on account of the highly flooded condition of the streams.

Fortress Lake.

It was first necessary to cut out a trail through thick forest around the north shore of Fortress Lake over very rough mountain-sides. There already existed a crude trail, cut by some hunting-party, but it was thickly overgrown and encumbered by fallen trees. This work was completed by July 2nd and on the 3rd camp was moved to the lower end of the lake. Here a station was occupied and exploration made for a route up a stream, referred to as Alder Creek, which comes in from the north at the foot of Fortress Lake and joins it outlet, the Wood River. The watershed lies at the head of the stream and it was necessary to ascend its valley.

Wood River Valley.

Wood River is the outlet of Fortress Lake. At the foot of the lake the valley opens in a long flat some 4 miles in extent, through which the river flows. It is composed partly of gravel wash, partly of meadow lands, and in part is covered by forest. Owing to flooding it was found necessary to cut a trail around the flooded parts. Camp was then moved down the flat and two stations occupied on the north side of the valley.

On July 9th camp was again moved to the end of the flat and a base established for operation on the south side of the valley. Beyond this flat the Wood River descends rapidly through a deep canyon and some 15 or 20 miles below is joined by a stream from the north. In the valley of this tributary is the old fur-trading route from Athabaska Pass to the Columbia River, but the trail is now almost obliterated.

Some miles directly behind the base camp is situated an exceptionally high, snow-crowned pyramid peak of 12,000 feet altitude above sea-level. It is hung with glaciers and a wide snow-field lies at its eastern side. It was necessary to reach the crest of the ridge bounding the snow-field on the south in order to cover country that could not be reached the previous season from the head of the West Branch of Athabaska River. To do this the party had to man-pack a camp up the valley of the stream flowing to the Wood River from the high peak referred to, a most strenuous undertaking, and from such a camp to reach the watershed by crossing the wide snow-field mentioned.

Five camera stations were occupied in this vicinity and the party got back to the base camp on July 19th. On the 21st a climb was made from the same camp of Chisel Peak, a very prominent peak arising directly above Fortress Lake on the south side, midway of its length.

Alder Creek Basin.

Camp was now moved to the junction of Alder Creek and the party started cutting trail up the valley to its head, which was reached on July 29th. Five stations were occupied and the camp then moved back to the east end of Fortress Lake. Two stations were now occupied at the head of a high valley, opening directly north of the east end of the lake, which overlooked the valley of a stream tributary to the Athabaska River.

Whirlpool River.

On August 6th the party started for the Whirlpool River, but before moving up to it supplies had to be brought out from Jasper. August 11th a move was made 15 miles up the whirlpool. It was now very smoky from forest fires and nothing could be done, so camp was moved farther up the Whirlpool trail and a raft built to cross the river to a desirable station.

Although very smoky, a climb was made on August 15th to a station on the west side of the river and some views taken. The 17th and 18th it rained steadily and cleared the smoke

away, and on the 19th it was possible to occupy a station on the east side of the valley to advantage. Camp was again moved up the river, and on the 20th a good station occupied at the junction of the South and Middle Branches.

Athabaska Pass.

On August 23rd the party moved up the South Branch of the Whirlpool to the summit of Athabaska Pass and pitched camp beside the little tarn known as "The Committee's Punch Bowl," from which the water flows east to the Atlantic and west to the Pacific Ocean. From the 24th until the 28th rain and clouds prevented further work, but on the 29th two stations adjacent to the pass were occupied. Next day the much-talked of Mount Brown was ascended, but clouds settled down over the summit and the climb had to be made a second time to get the necessary photographs and observations. The mountain supposed to be Mount Hooker was also ascended. Another station in the vicinity was occupied, and that closed the work at Athabaska Pass.

Mounts Brown and Hooker.

The reports of David Douglas, the botanist, first brought Mounts Brown and Hooker into prominence. According to his statements they rose to an altitude of between 16,000 and 17,000 feet above sea-level. The statements in Douglas's journal are far from lucid, and it is difficult, if possible, to adapt them to a more accurate knowledge of the topographical features of the pass. Subsequent explorations and surveys by Dr. A. P. Coleman reduced the altitude of the so-called Mount Brown to 9,050 feet, and the results of observations by the topographical division last summer have placed it at 9,156. The altitude of Athabaska Pass Summit, at the Committee's Punch Bowl, has been placed by the Boundary Survey at 5,751 feet above sea-level. Douglas, somehow, seems to have conceived the idea that this altitude was 11,000 feet, which, according to his statements, would place timber-line at the pass summit at 13,750 feet. The maximum altitude of timber-line in the main range is very close to 7,500 feet above sea-level, which fact reduces Douglas's statements to an absurdity. For some reason it seems to have been accepted as a fact that Mounts Brown and Hooker are situated on opposite sides of the summit of Athabaska Pass, Mount Brown on the north and Mount Hooker on the south. There does not appear to be anything in Douglas's reports to confirm this, and no arrangement of peaks as they actually are will permit of it. The only possible solution of the difficulty seems to be to select two peaks close to the summit of the pass that will, as nearly as possible, fill the conditions and dispose of the matter by naming one Mount Brown and the other Mount Hooker.

Headwaters of Canoe River.

The watershed, having crossed Athabaska Pass to the summit of the so-called Mount Brown, descends the same in a northerly direction and follows the western rim of the Whirlpool Valley for some miles before it turns north-west again. In this stretch there are two passes across the main divide, the valleys of which lead westerly to a larger valley holding a stream which it was supposed flowed to Canoe River. The head of this stream is at a height of land which is a summit of the watershed. On the opposite side the Middle Branch of the Whirlpool River has its source.

Canoe Pass.

On September 22nd the party moved camp to the summit of the most northerly and wider of the two passes referred to, which is here called "Canoe Pass." It is a charming spot with a delightful little lake near the summit, open grass lands, and groves of spruce trees. From this camp six camera stations were occupied.

On September 6th the party moved down the valley to the tributary of the Canoe River and up the same as far as possible. The going was very bad and a trail had to be cut a considerable part of the way. About 3 miles from the height of land at the head of the stream a tributary from the north-west comes from a high pass to the headwaters of the Fraser River, referred to here as "Fraser Pass." A trail was opened by a series of zigzags up a very steep hill to the summit of the pass, and on September 8th a climbing party occupied a prominent peak on the east side of it. On the same date camp was moved to the open lands near the summit. Rain and snow began on the 9th and continued without intermission until the 20th. Clouds were low down and nothing could be done in the way of photography.

Whirlpool Pass.

During the interval an exploration was made of the height of land between the Middle Branch of the Whirlpool and the tributary of the Canoe River. It is a low pass and crosses the watershed by a densely timbered valley. It is here referred to as "Whirlpool Pass."

Fraser Valley.

Camp was struck on September 21st and the party moved down the valley of the Fraser River. About 2 miles from the pass there was no snow on the ground and the falling snow had changed to rain. Camp was made in a sheltered spot and the party stayed there until the 25th in the hope that fine weather would set in, but it snowed and rained steadily and no photographing could be done. An exploration was made of a near-by valley which led to a pass of the watershed. On the eastern side a tributary stream flowed to the North Branch of the Whirlpool River. The entire summit of this pass is filled in by a beautiful little lake of vivid blue, which has a glacier falling directly into it on one side and an immense rock-slide on the other; as a route from the Whirlpool to the Fraser it is effectually barred.

The Fraser Valley lies nearly north-west and is a wide, densely timbered trough with several large tributary valleys joining it from the south-west, and three, including the pass referred to, from the north-east. There is no well-beaten trail, but evidently it has been travelled by Indians and trappers, as shown by the old teepee-poles and the blazes on the trees; a faint trail showed that horses had been taken over it in numbers at some previous time. The going is bad in many places owing to marshy ground, and a good amount of chopping had to be done to make it passable.

Close of the Survey.

The snow and rain still continued and the former now lay too deep on the peaks and above timber-line to permit of climbing; moreover, the entire region was now a snowscape, so it was realized that no further work would be possible and on September 25th the party started homewards. Lucerne, on the Canadian National Railway, was reached on September 28th and the same night camp was made at Yellowhead Pass.

The weather began to clear on the 27th and for the rest of the journey to Jasper was very fine. Jasper was reached by way of the Miette Valley on the 29th, and on the 30th the majority of the party left for Edmonton, where some of the members were paid off.

The two packers were sent with the horses back to Banff by the Athabaska, Saskatchewan, and Bow River route, a trip that took fourteen days and during which only two fine days were experienced. They got through only just in time, for the snow on the Wilcox Pass had drifted in places to a depth of 6 feet.

The two assistants returned to Banff and the usual tests of the cameras were made on October 4th, which closed the field-work for the season.

GAME AND FISH.

Taking into consideration the wide extent of country travelled over, it is surprising the little game that was seen. Caribou, moose, and small deer were seen infrequently and a few mountain-goats and bears. Their tracks, however, along the river-banks and in the woods leads one to think that they are more plentiful than appeared.

No fish were seen in any of the streams or lakes, except the Athabaska River, where a few were caught by the cook. It is likely that there are fish in the Fraser River, as they have been caught in Yellowhead Lake.

GENERAL REMARKS.

Owing to lack of trails on the British Columbia side of the watershed travel is difficult, and a very appreciable amount of time was consumed in cutting paths for the pack-train through the forest and in clearing out old paths.

The obtaining of camera stations was less difficult than the previous year owing to the assistance given by tributary valleys leading to the watershed, which were penetrated to their heads, and so the climbs started above timber-line, thus eliminating long ascents through tangled forest-growth.

The Whirpool River is thickly forested in the valleys of its three branches. The trail up the South Branch can be travelled, but it is a very bad trail, with much wet and treacherous

footing. It is difficult to picture it as a main route of the old fur-traders from the Athabaska to the Columbia River. Apparently there are no travelled trails up the Middle and North Branches.

The lay of the Fraser Valley, which parallels the watershed close by, would have made it possible to close the gap with the survey south from Yellowhead Pass had the weather been propitious. Under the existing conditions it was found impossible to do so, and about 20 miles of the watershed still remain to be located and the adjacent country mapped.

I have, etc.,

ARTHUR O. WHEELER,

Interprovincial Boundary Commissioner.

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1921.