

SUMMARY REPORT
OF THE
GEOLOGICAL SURVEY
DEPARTMENT OF MINES

FOR THE CALENDAR YEAR
1918

PRINTED BY ORDER OF PARLIAMENT



OTTAWA
J. DE LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1919

*To His Excellency the Duke of Devonshire, K.G., P.C., G.C.M.G., G.C.B.O., etc.,
etc., Governor General and Commander in Chief of the Dominion of Canada.*

MAY IT PLEASE YOUR EXCELLENCY,—

The undersigned has the honour to lay before Your Excellency, in compliance with 6-7 Edward VII, chapter 29, section 18, the Summary Report of the work of the Geological Survey, Department of Mines, for the calendar year ending December 31, 1918.

MARTIN BURRELL,
Minister of Mines.

To The Hon. MARTIN BURRELL,
Minister of Mines,
Ottawa.

SIR,—I have the honour to submit herewith the Directing Geologists' Summary Report of the work of the Geological Survey, Department of Mines, for the calendar year ending December 31, 1918.

I am, sir, your obedient servant,

R. G. McCONNELL,
Deputy Minister.

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SUMMARY REPORT, 1918, PART A.

REPORT OF THE DIRECTING GEOLOGIST.

By William McInnes.

INTRODUCTION.

During the season of 1918, the work of the Geological Survey was devoted more than ever to the investigation of areas and deposits that promised to be of economic importance. The number of field parties was fewer than in the period before the war, but investigations were carried on in all parts of Canada. In Yukon, particular attention was given to lode deposits upon which the establishment, there, of a permanent mining industry must depend. In British Columbia, the field parties were placed in areas where geological work seemed to be most greatly needed to help in their commercial development; and particular attention was given to the investigation of the platinum situation and to the prospects of securing a greater supply of that mineral which was then so urgently needed for the purposes of the war. Further work was done in the coal areas of western Alberta; and in the Great Plains area and to the north of it further progress was made in working out the structure of the rocks and its bearing upon the occurrence of oil and gas.

The examination of areas in northern Manitoba in which important copper sulphide deposits and gold-bearing veins occur, was continued and the extent of the areas more closely defined.

The geology of several areas in northern Ontario was studied; the pyrite deposits were specially investigated; and further structural work was done on the central Ontario oil fields.

Important mineral areas were mapped geologically in Quebec and in the Maritime Provinces; and at Malagash, in Nova Scotia, a deposit of salt and associated minerals was examined. The deposit is of interest both because it is the first bed of salt to be discovered in eastern Canada and because of its promising nature from an economic standpoint.

The continued use of the Victoria Memorial Museum building by the Parliament of Canada restricted the operations of the divisions that are more closely connected with museum work and their investigations in the field were curtailed or discontinued. A summary of the activities of these divisions during the year and of the Mineralogical, Topographical, Draughting, Photographical, and Publishing and Distribution divisions is given in the following pages.

GEOLOGICAL FIELD WORK.

W. E. Cockfield spent the greater part of the field season of 1918 examining the mineral resources of Mayo area, upper Stewart River district, Yukon Territory. This area is attracting attention since it is the only region in central Yukon in which, as yet, promising lode deposits have been located in considerable numbers. The lodes carry values in silver and lead, gold and silver, or tungsten. Mr. Cockfield also made a preliminary examination of the high grade silver-lead deposits of Spotted Fawn gulch, Twelvemile area, Yukon. Reports by Mr. Cockfield on these two areas have been published in Part B of the Summary Report for 1918.

Charles Camsell, besides undertaking work involved in the establishing and maintaining of a branch office of the Geological Survey, in Vancouver city, British Columbia, also examined during the field season of 1918 a number of mineral-bearing areas in the southern part of the province. He visited the mercury deposits at Copper creek on the north side of Kamloops lake. The information thus gained, together with notes on other occurrences of ores of mercury in the vicinity of Kamloops lake, on Sechart channel on the west coast of Vancouver island, and elsewhere in British Columbia, has been published in Part B of the Summary Report for 1918. Mr. Camsell also investigated the boring operations being conducted in the search for petroleum in the vicinity of Vancouver city and certain platinum-bearing occurrences in the Tulameen district and elsewhere. Reports on these subjects have been published in Part B of the Summary Report for 1918.

Mr. Camsell also examined the copper deposits of Copper mountain on Gun creek, Lillooet mining division. In a report on this locality published in Part B of the Summary Report for 1918, he points out the possibility of the existence of large, low grade copper deposits and of other valuable mineral deposits.

V. Dolmage spent the 1918 field season investigating the mineral resources and geology of Quatsino sound on the west coast of Vancouver island and also visited a number of other mineral occurrences on the west coast of the island. Copper, iron, gold, and coal are found in deposits along the shores of Quatsino sound and producing copper properties are located on Sydney inlet and near the entrance to Alberni canal. A report giving some of the results of the examinations made by Mr. Dolmage, has been published in part B of the Summary Report for 1918.

J. J. O'Neill spent the summer of 1918 in British Columbia, visiting the various smelters and the more important localities from which platinum had been reported. The information thus gained, together with all other available information relating to Canadian platinum possibilities, has been published in Part G of the Summary Report for 1918. In this report, Mr. O'Neill calls attention to the possibility of Canada becoming an important producer of platinum and makes various suggestions regarding the efforts necessary to attain such an end.

L. Reinecke during the summer of 1918, began an investigation of the mineral resources of a belt of country lying along the Pacific Great Eastern railway between Lillooet and 150-Mile House of the Cariboo wagon road.

The mineral products of the region covered have a wide range, and include both metallic and non-metallic deposits, some of them of a promising character. The deposits examined include gold-copper ores, chromite, molybdenite, clay, gypsum, epsomite, hydromagnesite, soda, muscovite, and the ornamental or gem-stone peridot.

The gold-copper ores, molybdenite and peridot, occur on Timothy mountain in the Cariboo district. Chromite is found in serpentines on Scottie creek about 90 miles north of Ashcroft. Muscovite-mica occurs in pegmatite dykes on the Cariboo mountains between Clearwater and Crooked lakes. Hydromagnesites are found as partly consolidated earthy beds, flooring areas of considerable size in the valley bottoms.

The deposits of clay include residual clays which might well be prospected for high grade fireclays and kaolin.

The beds of small, land-locked lakes near Clinton farther north, yield epsomite and sodium carbonate of comparative purity, in fairly large amount, and of these the epsomite deposit is being worked on a small scale.

A description of the various deposits will be given in a report now in preparation, and a preliminary account will be found in a paper contributed to the Canadian Mining Institute and published in the August, 1919, and following bulletins.

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B. R. MacKay spent the greater part of the 1918 field season in making a preliminary examination of the Cariboo gold fields, British Columbia. In his report published in Part B of the Summary Report for 1918, Mr. MacKay gives a general account of the present status and future possibilities of this very important placer gold district.

S. J. Schofield during the season of 1918 commenced an examination of the Britannia mining area on Howe sound, British Columbia. A report by Mr. Schofield, published in Part B of the Summary Report for 1918, contains a brief account of the results obtained during the first season's work at this important copper camp. Mr. Schofield also spent part of the field season revising and obtaining additional information regarding the ore deposits and geology of Ainsworth mining district, British Columbia. A short report published in Part B of the Summary Report for 1918 presents some of the additional conclusions regarding the geology of this area.

M. F. Bancroft during the field season of 1918 continued his investigation of the general geology and mineral deposits of the Lardeau district, British Columbia. In a brief report published in Part B of the Summary Report for 1918, Mr. Bancroft indicates the general situation as regards mining and development work in this district which contains so many silver-lead-zinc, gold, and other properties and prospects.

F. H. McLearn during the field season of 1918 made a geological examination of the section exposed along the lower part of Smoky river, a tributary of Peace river, western Alberta. This work was carried out in connexion with the general study of the conditions governing petroleum occurrences in Alberta and in his report published in Part C of the Summary Report for 1918, Mr. McLearn sets forth some of the general facts obtained and conclusions arrived at, that bear on the Peace River oil field and its possible southward extension into the Smoky River area.

J. A. Allan during the field season of 1918 made a geological examination of the Swan Hills district lying south of Lesser Slave lake, Alberta. This work was undertaken for the purpose of aiding in the correlation of the geology of the Peace River area and that of Edmonton district and central Alberta, to elucidate various problems in connexion with the general and economic geology. Some of the results obtained are set forth in a report by Mr. Allan, published in Part C of the Summary Report for 1918.

Bruce Rose during the field season of 1918 continued the general investigation of the coal resources and geology of southern Alberta and British Columbia. The work during 1918 was carried on about the headwaters of Oldman and Livingstone rivers within the Rocky mountains, and of Willow creek and tributaries in the foothills, thus completing the mapping of the Crownsnest coal field in Alberta. As stated in a brief report by Mr. Rose, published in Part C of the Summary Report for 1918, a large area of undeveloped coal lands forms the northward extension of the Crownsnest coal field, and from surface indications, compares favourably with the producing area to the south.

D. B. Dowling during the field season of 1918 carried on experimental work designed to ascertain the calorific value and also the commercial value of the natural gas of the Alberta field for the production of gasoline. A full description of the methods adopted and the results obtained is contained in a report published in Part C of the Summary Report for 1918.

J. Stansfield during the 1918 field season examined the surface deposits of a district in the southeastern part of Saskatchewan adjacent to Manitoba on the east and the United States on the south. In a report published in Part C of the Summary Report for 1918, Mr. Stansfield supplies information regarding the soil, and underground water supplies of this district.

A. MacLean examined during the summer of 1918 an area in southeastern Saskatchewan between the Manitoba-Saskatchewan boundary and the west side of range 21, W. 2nd mer., and from the International Boundary to the north side of township 8.

Mr. McLean reports that as a result of this year's work the section published last year can now be extended to include beds measuring 30 or 40 feet in thickness in the southern part of tp. 1, ranges 5 and 6, W. 2nd mer., and another lignite seam added lying about 50 or 60 feet above the top seam in the section previously given. In Saskatchewan three mines have worked this seam, (Frayne's, Adams', and Anderson's mines) and in north Dakota at least one mine, that of Makee Bros., situated a few yards south of the International Boundary and about 10 miles west of Portal.

Condensed Section, Southeastern Saskatchewan Lignite Field.

No.	Material.	Thickness.	Mines working.
		ft.	
1	Light yellow sands overlying sandy clays.....	70	Frayne, Adams, Anderson.
	Lignite.....	5	
2	Sandy clays.....	40	Occurs only in Roche-Percee district, eroded at Estevan.
	Buff sandstone.....	15	
	Lignite with banded clays.....	2	
	Grey clay.....	3	
	Lignite.....	5	
3	Sand and silt.....	20	Upper Estevan seam. All mines at Estevan except Wooloomooloo.
	Lignite at Estevan and Bienfait 7 to 10 feet.....	4	
4	Stiff, blue-grey clay or in some cases incoherent sand 20 to 50 ft.....	25	See note below.
	Lignite Taylorton seam.....	6	
	Dark grey clays and sands.....	130	
5	Lignite.....	2	
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	Lignite.....	4	
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	Shales extending to at least 500 ft.....		

The areal extent of the various seams in the Estevan, Roche Percee, Bienfait district, was established as closely as the scarcity of exposures and drill records, and the irregularity of the beds allowed.

Seam No. 1. The top seam (Frayne, Adams, Anderson, Makee seam) is found only in the highest land south of Roche Percee and between North Portal and Short Creek. It has not been identified outside of a rectangle extending from Short Creek eastward for 8 miles and from the boundary northward for 4 miles. Southward it probably extends for a considerable distance into North Dakota, but it was not traced beyond the Makee mine. To the north of the Souris valley, near Taylorton and eastward from this, there is an irregular occurrence of a 4-foot seam whose relationships are somewhat similar to this seam. It may be that these two beds of lignite should be correlated with one another, but sufficient evidence is not yet at hand to do so.

Seam No. 2. (The top of first workable seam of the section given in the 1917 summary.) This seam has its maximum development in the district closely adjacent to Roche Percee and to the south of the river where it is worked by the

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Saskatchewan Collieries Company, J. A. Auld, Duncan Campbell, and others. It is not well marked to the west of Short creek and to the east it has not been observed in wells drilled in the middle of tp. 1, range 5, W. 2nd mer. Hence its limits as at present known may be taken as practically the same as for the seam above, except that it extends for about a mile farther north than the upper seam, or to its outcrop in the south bank of the Souris valley. To the north of the river it is split up into narrow unworkable seams.

Seam No. 3. The upper Estevan seam (previously called the second workable seam) is now worked only in the Roche Percee and Estevan districts. At the former place it is worked in the Siddall mine in Short creek and the Interprovincial mine just across the river from the village. At Estevan all the mines with the exception of the Woolloomooloo are operating on this seam, and in addition there is one mine on Long creek near Wood End. The Sherman mine near Bienfait was working on this seam but has not been in operation for some time. In general terms it may be said to extend throughout tp. 1, range 6, and tps. 1 and 2, ranges 7 and 8, W. 2nd mer. In the north part of tp. 2, ranges 7 and 8, it is for the most part removed by erosion, as it is also in the neighbourhood of Bienfait. To the southeast of Estevan, near Shand, it becomes so thin as to be unworkable, but beyond Shand in the same direction it thickens again until at Roche Percee it is well represented in the Interprovincial mine. Although at Bienfait this seam has been eroded, the dip of the beds should bring it into the section between this place and Taylorton. No lignite bed of its character occurs there, however, and the probability is that it ends in a sand bed.

Seam No. 4. The lowest lignite bed worked in the district, the Taylorton seam, has the widest extent and is probably the most consistent. It is worked by Niels Anderson in sec. 28, tp. 1, range 8, W. 2nd mer.; by the Woolloomooloo mine at Estevan; by the Saskatchewan Coal, Brick, and Power Company at Shand; and by all the mines at present operating in the Bienfait-Taylorton district. Six miles west of the Anderson mine above mentioned, Mr. Thos. Hite of Estevan, reports 14 feet of coal in a well at 114 feet, which lignite is probably an extension westward of this seam. To the east of Taylorton it occurs for only a short distance and then is lost in an accumulation of sand which marks the encroachment of sand bars and shoals on the vegetation preserved in the lignite beds. The extension northward of the seam is for the most part limited. The beds rise toward the north and this brings the lignite to the surface a short distance north of Estevan in tp. 2, range 8. In general terms it may be said to extend throughout tps. 1 and 2, ranges 6, 7, 8, and 9, W. 2nd meridian.

As the seams below this (represented at depths of 200 feet, 400 feet, and 625 feet at Taylorton) are only encountered in bore-holes which penetrate to these depths, their distribution and extent is even more difficult to determine. It is probable that their eastern extent is to be found near Oxbow where remnants of a seam are encountered at a depth of about 400 feet on the higher elevations of the old eroded glaciated surface. To the east of this the erosion was even greater and but few traces of the lignite beds are left. Westward from Estevan the few records at present available point to the extension of lignite bearing beds as far west as the Big Muddy valley, but it cannot yet be said to what horizon the coal seams in them belong.

E. L. Bruce during the field season of 1918 carried on work in connexion with the general and economic geology of the Athapapuskow Lake district, Manitoba, where new finds prove that the area of copper-bearing formations extends much farther than previously supposed and also show that additional types of deposits are present. Mr. Bruce in a report published in Part D of the Summary Report for 1918 records the new developments and directs attention to general conditions governing mineral production in the district.

Mr. Bruce during 1918 also visited a district in the vicinity of Falcon and Star lakes in southeastern Manitoba in order to examine and sample certain gold quartz veins reported to carry appreciable amounts of platinum, and also to examine certain deposits of scheelite. The results of his investigations are contained in a report published in Part D of the Summary Report for 1918.

Mr. Bruce in 1918 likewise investigated and mapped a large district lying between Reed lake and Elbow lake in northern Manitoba, and situated between the two important mineral-bearing areas of, respectively, the Amisk-Athapuskow and the Wekusko Lake districts. A general report by Mr. Bruce on this district is contained in Part D of the Summary Report for 1918.

F. J. Alcock spent the greater part of the field season of 1918 in the Reed and File Lakes region of northern Manitoba adjoining on the northeast the area above referred to as having been examined by Mr. Bruce. Mr. Alcock described the geology and economic possibilities in a brief report published in Part D of the Summary Report for 1918.

Mr. Alcock spent a part of the field season in the Wekusko Lake area, Manitoba, completing the work of the previous season. In a report published in Part D of the Summary Report for 1918, Mr. Alcock gives further notes on the geology and some of the more important gold deposits of the district.

W. A. Johnston during the field season of 1918 completed the examination of the soils and superficial deposits of a large district in Manitoba bordering the southern part of lake Winnipegosis and extending westward to the foot of Duck mountain. A large area within the district is available for homestead entry and the work being carried on by Mr. Johnston was performed largely in order to supply prospective settlers with information regarding the general character of the district and to indicate the areas most suitable for settlement.

T. L. Tanton during the field season of 1918 examined an area approximately 35 miles wide and extending for about 125 miles along the Canadian National railways, formerly the Canadian Northern, between Gogama and Nipigon stations, western Ontario. The work was undertaken for the purpose of obtaining information regarding the mineral resources of the district and in a report published in Part E of the Summary Report for 1918, Mr. Tanton gives an account of the results obtained.

W. H. Collins during the field season of 1918 carried on field work in two considerable areas in Michipicoten district, Ontario, one in the vicinity of Goudreau, and the other in the neighbourhood of Magpie and Hawk Junctions on the Algoma Central railway. Extensive pyrite deposits occur in these areas, in some cases affording a large production; important bodies of iron ore are also present as well as gold-bearing deposits. A full description of these two areas has been published in Part E of the Summary Report for 1918.

M. Y. Williams during the field season of 1918 continued his investigation of the oil fields of southwestern Ontario. In a report published in Part E of the Summary Report for 1918, Mr. Williams presents some of the results obtained from his field work.

H. C. Cooke spent the field season of 1918 in completing the geological examination of twelve townships surrounding and including the Matachewan gold discoveries made in 1916. The origin of the gold deposits, their nature and mode of occurrence has been determined. The data so obtained are expected to be useful in other explorations for gold in the general region.

M. E. Wilson spent the early part of the 1918 field season in an examination of an area adjacent to the village of Maniwaki, Quebec, at the termination of the Gatineau Branch of the Canadian Pacific railway, where a number of important molybdenite and other mineral deposits occur. The latter part of the season was spent in continuing the study of the district in the vicinity of Renfrew, Ontario. Mr. Wilson also paid short visits to a number of localities of economic interest outside of the above areas.

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R. Harvie during the field season of 1918 was engaged, under the direction of the War Trade Board, in special work connected with the production of chromite ores from the Thetford-Black Lake district, Quebec.

G. A. Young was engaged during the field season in the study and mapping of the geology of a district in the Eastern Townships of Quebec represented by the "Sutton sheet", one of a series of topographic maps on a scale of 1 inch to 1 mile, published by the Department of Militia and Defence. This district has an area of about 460 square miles and extends from the National Boundary northward to Knowlton on the east and almost to Farnham on the west. The Department of Militia and Defence has now published a number of topographical sheets, each representing an area of about 460 square miles and which, combined, represent a large region extending from the International Boundary northeastward to and beyond Richmond. This region is the southwestern portion of that economically important mineral-bearing area of southeastern Quebec which embraces the hilly and mountainous country extending northeastward from the Vermont border towards Gaspé and has long been known because of its important deposits of copper, chromite, asbestos, and other mineral products. A proper understanding of the economic possibilities of the region must be based on a detailed study of the general geology and structure of the region. The general geology of the region is intricate and, although since an early date it has been the subject of much attention by the Geological Survey, yet the lack of adequate topographical maps has greatly retarded progress. Now that such maps are available it is possible to commence a systematic study of the various geological problems and with that end in view, Mr. Young was instructed to commence work in the southwestern end of the mineral-bearing region.

B. R. MacKay in the early part of the field season of 1918 completed the geological mapping of the Beauce gold fields, Quebec.

E. R. Faribault during the 1918 field season continued the topographical and geological work already commenced in Shelbourne county, Nova Scotia. Mr. Faribault also examined deposits of manganese at Black Rock, Colchester county, Nicholsville, Kings county, and Salem Road, Cumberland county. An account of these deposits, together with notes on various occurrences of platinum in Nova Scotia, is contained in a report by Mr. Faribault published in Part F of the Summary Report for 1918.

A. O. Hayes spent a part of the field season of 1918 revising the structural geology of the southeastern part of the Sydney coal field, Nova Scotia, in order to locate more definitely the outcrops of certain workable coal seams. He also made brief examinations of the St. Rose and Chimney Corner coal field, Inverness county, the New Campbellton coal field, Victoria county, and the Kemp-town coal field, Colchester county. Mr. Hayes also examined the zinc-lead-copper deposit at Stirling, Richmond county, an occurrence of sericite schist near Louisburg, and a manganese deposit on Gowland mountain near Elgin Corner, New Brunswick.

Mr. Hayes also visited a recently discovered deposit of salt at North Shore, Malagash peninsula, Colchester county, Nova Scotia. This salt deposit is the first to be developed by mining operations in the Maritime Provinces.

The results of the various examinations made by Mr. Hayes, together with an account of the manganese deposits of New Ross, Lunenburg county, Nova Scotia, are contained in a report published in Part F of the Summary Report for 1918.

A. Anrep examined a number of peat bogs in New Brunswick. Details of the character, extent, and value of the bogs visited are given in a report by Mr. Anrep, published in Part F of the Summary Report for 1918.

VERTEBRATE PALEONTOLOGY.

L. M. Lambe during 1918, was principally engaged in the study of materials from the Edmonton and Belly River Cretaceous included in collections of recent years. A number of collections of fossils made by officers of the department and others have been determined and reported upon. No field work was done. During the course of the year C. M. Sternberg engaged in the preparation and permanent mounting of various specimens, as also did G. F. Sternberg during the first half of the year up to the time of his resignation.

INVERTEBRATE PALEONTOLOGY.

E. M. Kindle, besides examining several sections in the lower Ottawa valley, visited point Pelee in order to prepare for the Department of Public Works, a report on the cause of the very active erosion in progress there. In this work he was assisted by E. J. Whittaker.

The needs of Parliament for more space in the Victoria Museum necessitated early in the year the removal of the offices of this division to another building. The transfer and rearrangement of the extensive study collections occupied considerable time and materially interfered with office work. E. M. Kindle continued his work on the Mackenzie River Devonian fossils. L. D. Burling continued his work on the Cambrian fauna of British Columbia. A number of special reports on fossils were prepared for officers of the department.

PALEOBOTANY.

W. J. Wilson continued the study and cataloguing of palaeobotanical collections belonging to the Survey.

MINERALOGICAL DIVISION.

R. A. A. Johnston and his staff, consisting of Eugene Poitevin, H. V. Ellsworth, and M. F. Connor, carried on during the year the usual mineralogical work. The number of inquiries received for information regarding Canadian ores and minerals and their commercial application is markedly increasing. During the field season Mr. Poitevin spent several months in British Columbia investigating certain areas of basic eruptives which it was considered might possibly contain platinum in commercial quantities. Mr. Poitevin also spent some time in the Black Lake-Thetford Mines area, Quebec, in a continuation of his study of the mineralogy of this district. Mr. Ellsworth spent some time in the field collecting specimens for museum and laboratory purposes.

A. T. McKinnon was engaged during the year in cataloguing museum specimens and also continued in charge of the distribution of collections for educational purposes and of the collecting of materials for the same.

During the year considerable progress has been made in arranging, on two floors of the building at 227 Sparks street, a display of the economic minerals of Canada. A special collection of Canadian economic minerals together with photographs and necessary display cases, was prepared and despatched for the *Faire de Lyon*, France.

TOPOGRAPHICAL DIVISION.

The division sustained an irreparable loss in the death of one of the ablest topographers, Major W. E. Lawson, who died, from wounds received in France, on August 29, 1918.

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During the year the following topographers were still serving with the Canadian Expeditionary Force: S. C. McLean, A. G. Haultain, J. R. Cox, and E. E. Freeland.

W. H. Boyd, chief topographer, furnishes the following table showing the mapping work carried on during the field season by the division.

Locality.	Field scale.	Contour interval.	Topographer in charge.
Britannia Beach, British Columbia.....	36000	100	K. G. Chipman.
Coquihalla river, British Columbia.....	48000	100	F. S. Falconer.
North Thompson river, British Columbia.....	48000	100	D. A. Nichols.
Townships 47 to 55, ranges 5 to 16, west 4th mer., Alberta.	144000	100	A. C. T. Sheppard.
Calabogie, Ontario, and Sydney, Nova Scotia.....	36000	C. H. Freeman.

BORINGS DIVISION.

E. D. Ingall, chief of the borings division, reports that during the year the work continued along the lines heretofore followed. The work of collecting records of borings and sets of samples from the strata passed through was greatly facilitated in certain districts by the co-operation of the field geologists of the Geological Survey. Studies were made, microscopically and otherwise, of sets of samples from a number of wells in different parts of Canada. The results obtained and the correlations arrived at were communicated to the drillers for their use in the prosecution of their operations. Similar aid was rendered in a number of cases through a search of the published geological literature for data relating to districts where borings are in contemplation, or in progress, in search for water, natural gas, or petroleum. In various other ways service was rendered to these interests throughout Canada.

	No. of bags sent out.	No. of samples received.	No. of wells from which samples received.	No. of records received.	No. of circulars sent out.
Maritime provinces.....	2,500	2,606	12	11	} 460
Quebec.....	100	26	1	31	
Ontario.....	7,495	3,371	14	51	
Northwest provinces.....	1,400	697	6	402	
British Columbia.....	450	2	
	11,945	6,700	33	469	460

BIOLOGICAL DIVISION.

The work of the division was interrupted in January, 1918, on account of the necessity of moving the offices from the Victoria Memorial Museum building to make room for the needs of Parliament. The staff of the biological division were given new quarters on the fourth floor of the Lowe-Martin building on Nepean street, Ottawa. The herbarium and study collections of mammals, birds, and invertebrates were moved at the same time, so that the scientific work of the division was continued, although public exhibition was suspended.

In March, 1918, the dismantling and tearing down of the old Fisheries Museum on Queen and O'Connor streets, gave opportunity to obtain a large collection of casts of fishes and a quantity of other marine material, as well as some mammal and bird specimens. The Department of Marine and Fisheries is to be thanked for the interesting zoological material obtained on the occasion of the closing of the Fisheries Museum.

Botany.

John Macoun continued during the year his botanical work on Vancouver island. The collections made by Mr. Macoun will be added to the herbarium of the Geological Survey.

James M. Macoun has spent much time in the work of the whole division as well as in the determination of specimens sent in by correspondents and collectors from all parts of Canada. During the summer of 1918 Mr. Macoun made extensive collections in Jasper Park, Alberta, carrying on a general biological investigation of the various life zones of the park, particularly on the upper Athabaska river and Shovel Pass region. Mr. Macoun's work was an attempt to carry on to completeness the results of former years' investigation of this park region from the beginning to the end of the flowering season.

In addition to the collections made by the staff during the year, the Dominion Herbarium has received 315 specimens (donated), as well as the collection of the late W. H. Harrington, of 295 Gilmour street, Ottawa, consisting of 1,619 mounted sheets and 81 small bottles of seeds, presented by Mrs. Harrington, June 4, 1918. The plants mounted during the year number 2,789; plants distributed, 2,063.

Zoology.

R. M. Anderson, zoologist (in charge of mammals), gave attention during the year to the study of the zoological material collected while on the Canadian Arctic Expedition from 1913 to 1916, particularly the mammals and birds. He has also spent considerable time in reading and editing manuscripts and proofs of the technical biological reports, both terrestrial and marine, of the said expedition. The arrangement and classification of the already extensive collections of the Geological Survey have been carried on. In September and October, 1918, at the request of the Department of the Interior, Mr. Anderson spent several weeks inspecting wild life sanctuaries in the provinces of Saskatchewan and Alberta.

P. A. Taverner, zoologist (in charge of birds), has devoted much of his time to the study and classification of the extensive collection of birds already in the possession of the department. One thousand three hundred new specimens of birds were added to the collection during 1918. In the early summer of 1918, Mr. Taverner made a reconnaissance and collecting trip by boat along the Rideau canal, river, and lakes, from Ottawa to Kingston, and later in the summer a similar trip was made from Ottawa to the mouth of the Ottawa river in company with Clyde L. Patch.

C. H. Young spent the season from April 23 to October 2, in the vicinity of Shoal lake, Manitoba, completing the collections made there the previous season by Mr. Taverner and Mr. Young. Mr. Young's collections for the season consisted of 622 birds and 15 mammals.

Clyde L. Patch and the other members of the preparatory staff were engaged in the preparation of small bird and mammal groups for exhibition when space becomes available in the museum. Claude L. Johnson continued his work of preparing accessories for groups and backgrounds for exhibition material, and also made some coloured drawings for illustrating bulletins of the department. D. Blakeley prepared birds and mammals which came to the museum, as well as cleaned, degreased, and remade old skins in the collection. J. Perron continued his work of scraping, tanning, and dressing large mammal skins for storage and mounting. Joseph Rochon continued the work of cleaning and bleaching the accumulated collection of mammal skulls in the museum, putting them in shape for scientific examination, finishing about 1,000 skulls, and beginning the cleaning and mounting of a series of small mammal skeletons for exhibition in the museum.

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J. Johansen continued his work on botanical, entomological, and marine specimens collected on the Canadian Arctic Expedition, from 1913 to 1916, for the first three months for the Geological Survey and for the balance of the year for the Department of Naval Service. A considerable number of specimens of invertebrates collected on former northern expeditions were overhauled, catalogued, and sent away for determination, in connexion with the series of Arctic reports now being published.

ANTHROPOLOGICAL DIVISION.

Ethnology and Linguistics.

Owing to the economies enforced by the war, the field work undertaken during 1918 was less than in normal years. The hall of Canadian anthropology in the Victoria Memorial Museum remained closed to the general public. A special exhibit of Indian handicrafts was provided in collaboration with the Department of Indian Affairs, for the Central Canada Exhibition.

E. Sapir was engaged chiefly in research work in connexion with materials previously collected. C. M. Barbeau conducted a folklore and ethnographic survey of certain groups of French peasants in Temiscouta and Gaspé counties, Quebec. E. Z. Massicotte carried on folk-lore research in the Montreal district. F. W. Waugh carried on scientific researches among the Iroquois Indians at Grand River reserve, Ontario. J. A. Teit could devote only part of his time in 1918 to the services of the Survey.

Archæology.

The hall of Canadian archæological exhibits in the Victoria Memorial Museum during 1918 remained closed to the general public. Archæological field work has been practically stopped for two years in order to enforce war economy. In 1918, H. I. Smith accompanied one of the geological field parties working in southern British Columbia and secured much information of archæological interest. W. J. Wintemberg throughout the year engaged in research work in the office.

Physical Anthropology.

F. H. S. Knowles continued various lines of work in connexion with physical anthropology.

PHOTOGRAPHIC DIVISION.

G. G. Clarke and staff, as in former years, performed a large amount of photographic work, much of it of a highly technical character and very essential in connexion with the work of the topographical and draughting divisions. During the year over 17,000 negatives, plates, prints, etc., were developed or otherwise treated.

LIBRARY.

The main library remained in the Victoria Memorial Museum and a small branch library was continued in the temporary offices of the Geological Survey. During the year, 940 volumes, pamphlets, and maps were received as gifts or exchanges, and 245 books were purchased.

DISTRIBUTION OF PUBLICATIONS.

During the year 1918, 43,800 publications of the Geological Survey, exclusive of French editions, were distributed. Of these, 31,072 were distributed in compliance with written and personal requests, and 12,728 were sent to addresses on the mailing lists.

In the case of French translations of Geological Survey publications, the Publishing and Translating Division, Department of Mines, reports that during 1918 they distributed 11,901 copies. Of these, 9,455 were distributed in compliance with written and personal requests, and 2,446 were sent to addresses on the mailing lists.

MUSEUM.

Owing to the continued occupation of the Victoria Memorial Museum by Parliament the greater part of the exhibits of the National Museum during 1918 were in storage or not open to the public. The exhibit of Canadian economic minerals in the premises at 227 Sparks street has continued to be open to the public and has been further enlarged. The work of preparing exhibits for the National Museum was continued by the various divisions.

The practice of providing illustrated lectures to the public on topics of general interest was continued throughout the year, though such lectures had to be given elsewhere than in the Victoria Museum. Altogether twenty-eight lectures were given, on twenty-one subjects, by fourteen lecturers.

GEOGRAPHICAL AND DRAUGHTING DIVISION.

C.-Omer Sénécal reports that during 1918, twenty-three new maps were published, and at the close of the year, seven other maps were in the hands of the King's Printer for engraving or printing. At the same date, sixty-two other maps in various stages of compilation or preparation for publication remained with the division. As usual, a large number of sketch maps, diagrams, text figures, and other drawings were also executed. Mr. Sénécal also attended to the duties required of him as a member of the Geographic Board.

Maps in Hands of the King's Printer, December 31, 1918.

Publication number.	Title.	Date of requisition.
1584	Blairmore, Alberta. Geology; scale, $\frac{1}{62500}$	Sept. 6, 1918.
1585	Mackenzie River basin; scale, 50 miles to 1 inch.....	Aug. 28, 1918.
1691	Buckingham, Ottawa and Labelle counties, Quebec; scale, 1 mile to 1 inch.....	Oct. 2, 1917.
1705	Thetford, Quebec. Topography; scale, 4,000 feet to 1 inch.....	Feb. 8, 1918.
1706	Anyox, Observatory inlet, Cassiar district, British Columbia. Topography; scale, $\frac{1}{12500}$	March 23, 1918.
1707	New Glasgow, Pictou county, Nova Scotia. Topography; scale, $\frac{1}{25000}$	May 3, 1918.
1708	Bridge river, between Rexmount and Gun lake, Lillooet district, British Columbia. Topography; scale, $\frac{1}{12500}$	Jan. 23, 1918.

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Geological Survey Maps Published During the Year 1918.

Series A.	Publication number.	Title.	Remarks.
		<i>Yukon Territory.</i>	
	1702	Klotassin; scale, 2 miles to 1 inch.....	Geology.
		<i>British Columbia.</i>	
42	1192	Duncan sheet, Vancouver island; scale, 1:225000.....	Geology.
44	1194	Sooke sheet, Vancouver island; scale, 1:225000.....	Geology.
165	1582	Windermere, Kootenay district; scale, 1:225000.....	Topography.
	1704	Ainsworth, Kootenay district; scale, 1:225000.....	Topography.
	1711	Route traversed by the Great Pacific Eastern railway, between Squamish and Lillooet; scale, 4 miles to 1 inch....	Geology.
		<i>Alberta.</i>	
	1593	Blairmore; scale, 1:225000.....	Topography.
	1712	The foothills of southern Alberta; scale, 4 miles to 1 inch....	Geology.
	1725	Well sections in the geological formations of southern Alberta	Geology.
115	1336	Sheep river, Alberta; scale, 4 miles to 1 inch.....	Topography.
		Structure sections, central Alberta; scale, 10 miles to 1 inch.	Geology.
		Structure section, North Saskatchewan river; scale, 10 miles to 1 inch.....	Geology.
		<i>Saskatchewan.</i>	
	1720	Deposits of gravel in the vicinity of Regina; scale 4 miles to 1 inch.....	Economic geology.
		<i>Manitoba.</i>	
135	1391	Lower Churchill river; scale, 16 miles to 1 inch.....	Geology.
		<i>Ontario.</i>	
132	1379	Southwest portion of Rainy River district; scale, 2 miles to 1 inch.....	Soils.
	1710	Bothwell-Thamesville oil region, Kent county; scale about 1-12 miles to 1 inch.....	Economic geology.
	1714	The Niagara peninsula; scale, 4 miles to 1 inch.....	Geology.
	1715	The Ontario peninsula; scale, 12 miles to 1 inch.....	Geology.
		<i>Quebec.</i>	
145	1495	Timiskaming county; scale, 12 miles to 1 inch.....	Geology.
183	1630	Harricana-Turgeon basin; scale, 4 miles to 1 inch.....	Geology.
	1681	Portion of Amherst township, Labelle county; scale about 1,750 feet to 1 inch.....	Geology
		<i>New Brunswick.</i>	
164	1581	St. John, St. John and Kings counties; scale, 1:225000.....	Topography.
	1709	Burnhill Brook tungsten area, York county; scale, 4 miles to 1 inch.....	Geology.

PUBLICATION DIVISION.

Marc Sauvalle, chief of publishing and translating division, reports that the following memoirs, museum bulletins, and summary reports were published during the calendar year 1918:

English Reports.

1686. Memoir 99, Geological Series 82. *Road material surveys in 1915*—by L. Reinecke; pp. i-v, 1-190; plates, 10; figures, 10; maps, 2; edition, 2,500 copies; published January 8, 1918.
1694. Memoir 102, Geological Series 85. *Espanola district, Ontario*—by Terence T. Quirke; pp. i-iii, 1-92; plates, 6; figures, 8; map, 1; edition, 3,000 copies; published January 8, 1918.
1695. Memoir 103, Geological Series 86. *Timiskaming county, Quebec*—by M. E. Wilson; pp. i-vi, 1-197; plates, 16; figures, 6; map, 1; edition, 3,500 copies; published May 25, 1918.
1696. Museum Bulletin 27, Geological Series 35. *Contributions to the mineralogy of Black Lake area, Quebec*—by Eugene Poitevin and R. P. D. Graham; pp. i-ii, 1-103; plates, 12; figures, 22; edition, 2,500 copies; published March 29, 1918.

1716. Memoir 105, Geological Series 87. *Amisk-Athapapuskow Lake district*—by E. L. Bruce; pp. i-iii, 1-91; plates, 7; figures, 4; map, 1; edition, 3,000 copies; published October 10, 1918.
1717. Museum Bulletin 28, Biological Series 7. *The hawks of the Canadian prairie provinces in their relation to agriculture*—by P. A. Taverner; pp. i, 1-18; plates, 4; figures, 7; edition, 4,000 copies; published November 16, 1918.
1718. *Summary Report of the Geological Survey, Department of Mines, for the calendar year 1917, Part D*; pp. 1D-46D; edition, 3,000 copies; published September 4, 1918.
1719. *Summary Report of the Geological Survey, Department of Mines, for the calendar year 1917, Part B*; pp. 1B-48B; figure, 1; edition, 3,000 copies; published November 7, 1918.
1721. *Summary Report of the Geological Survey, Department of Mines, for the calendar year 1917, Part C*; pp. 1C-59C; figures, 3; edition, 3,000 copies; published November 7, 1918.
1727. *Summary Report of the Geological Survey, Department of Mines, for the calendar year 1917, Part E*; pp. 1E-48E; figures, 13; maps, 1; edition, 3,000 copies; published December 10, 1918.
1728. Memoir 106, Geological Series 88. *Road materials in a portion of Vautreuil county, Quebec, and along the St. Lawrence river from the Quebec boundary to Cardinal, Ontario*—by R. H. Picher; pp. i, 1-12; edition, 1,000 copies; published November 21, 1918.

French Translations.

1643. Memoire 92, Série géologique 74. *Etude d'une partie de la région du lac Saint-Jean, Québec*—by John A. Dresser; pp. i-iii, 1-95; plates, 5; figures, 2; map, 1; edition, 1,000 copies; published December 13, 1918.
1688. *Rapport sommaire de la Commission géologique du Ministère des Mines pour l'année civile 1916*; pp. i-xiv, 1-450; figures, 12; maps, 13; edition, 1,500 copies; published March 22, 1918.
1729. Memoire 98, Série géologique 81. *Gisements de magnésite du district de Grenville, comté d'Argenteuil, Québec*—by M. E. Wilson; pp. 1-ii, 1-84; plates, 11; figures, 2; maps, 3; edition, 1,000; published December 18, 1918.
1737. *Minéraux industriels du Canada*—by Wyatt Malcolm; pp. 1-16; published December 28, 1918.

ACCOUNTANT'S STATEMENT.

By John Marshall.

The funds available for the work and the expenditure of the Geological Survey for the fiscal year ending March 31, 1918, were:

	Grant.	Expenditure.
Amounts voted by Parliament.....	\$ 518,522 50	
Civil list salaries.....		\$ 196,043 30
Explorations in British Columbia and Yukon.....		21,148 45
Topographical surveys in British Columbia.....		4,142 30
Explorations in Northwest Territories.....		32,557 88
Topographical surveys in Northwest Territories.....		4,397 26
Explorations in Ontario.....		10,957 39
Topographical surveys in Ontario.....		5,284 00
Explorations in Quebec.....		1,631 66
Topographical surveys in Quebec.....		2,648 84
Explorations in New Brunswick.....		1,699 97
Explorations in Nova Scotia.....		4,870 86
Topographical surveys in Nova Scotia.....		4,138 55
Explorations in general.....		2,615 28
Investigations of road materials.....		8,530 78
Paleontological investigations.....		7,558 68
Ethnological investigations.....		968 80
Boring operations.....		4,567 00
Publication of reports.....		38,145 35
Translation of reports.....		3,142 77
Publication of maps.....		23,128 68
Wages, outside service.....		17,156 72
Stationery, mapping material, sundry printing.....		7,548 99
Miscellaneous.....		7,253 32
Library.....		1,533 05
Photographic supplies.....		1,368 07
Postages and telegrams.....		1,278 02
Civil Government contingencies.....		1,253 02
Specimens for Museum.....		1,015 81
Instruments and repairs.....		795 90
Cataloguing publications.....		685 60
Legal fees.....		582 20
Advertising.....		469 61
Compensation to J. F. Lyons in lieu of quarters, fuel, and light.....		400 00
Balance unexpended and lapsed.....		99,004 39
	\$ 518,522 50	\$ 518,522 50

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Summary.

	Grant.	Expenditure.	Grant not used.
Civil government appropriation.....	\$ 246,122 50	\$ 196,043 30	\$ 50,079 20
Explorations and surveys in Canada.....	150,000 00	122,120 02	27,879 98
Publication of reports and maps; translating.....	65,000 00	65,000 00
Purchase of books, instruments, miscellaneous.....	50,000 00	33,685 96	16,314 04
Purchase of specimens for Victoria Memorial Museum.....	5,000 00	1,015 81	3,984 19
Compensation to J. F. Lyons for quarters, fuel, and light....	400 00	400 00
Civil government contingencies.....	2,000 00	1,253 02	746 98
	\$ 518,522 50	\$ 419,518 11	\$ 99,004 39

Casual Revenue.

Sales of equipment.....	\$ 439 00	
Sales of publications.....	65 48	\$ 504 48

