CANADA

Annual Report

DEPARTMENT
of
MINES AND RESOURCES

Fiscal Year Ended
March 31, 1949

PRICE, FIFTY CENTS

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REPORT OF THE

DEPARTMENT

OF

MINES AND RESOURCES

FOR THE

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MARCH 31, 1949

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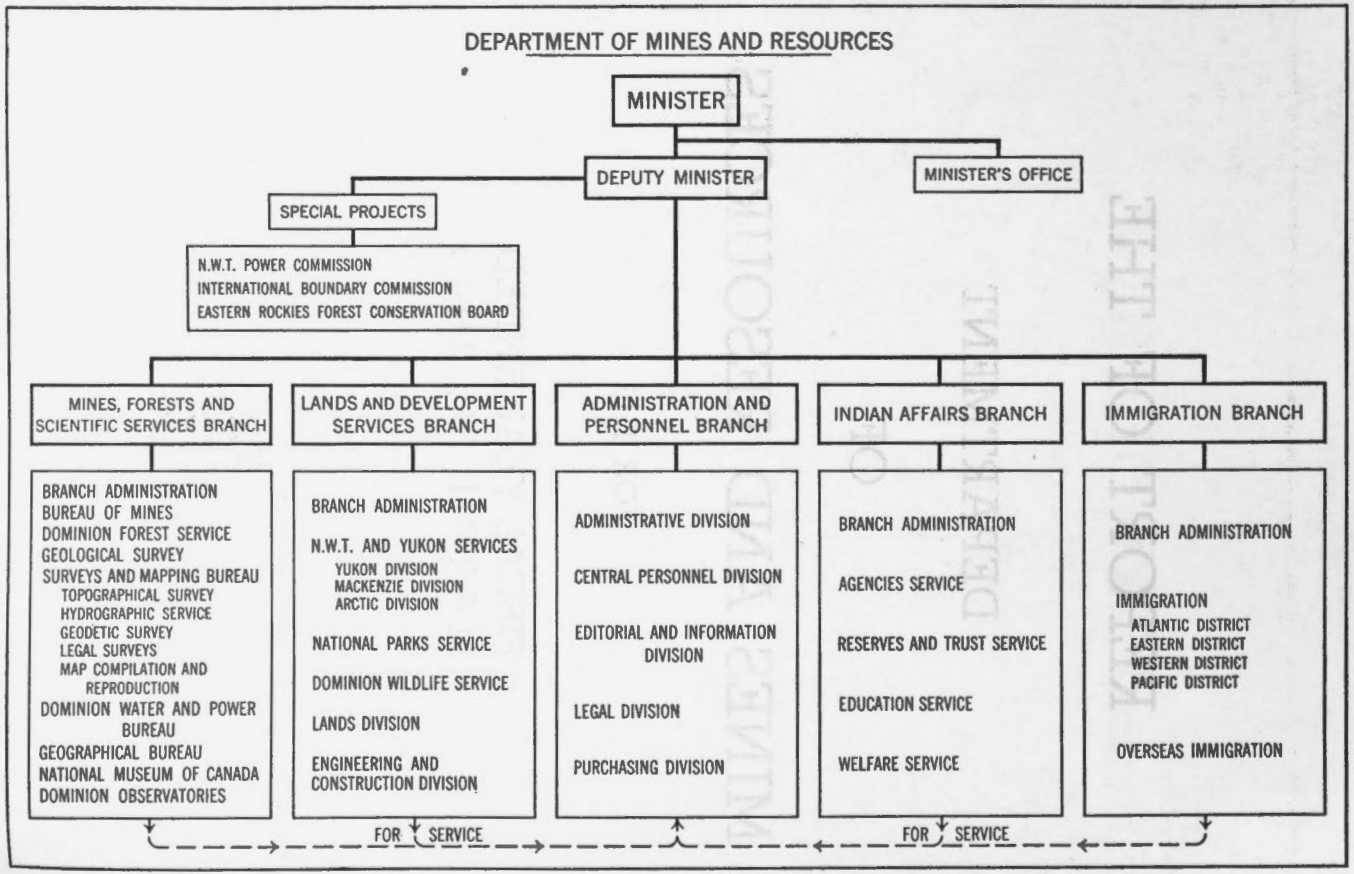

Organization Chart, Department of Mines and Resources.

CONTENTS

To His Excellency Field Marshal the Right Honourable Viscount Alexander of Tunis, K.G., G.C.B., G.C.M.G., C.S.I., D.S.O., M.C, Governor General and Commander-in-Chief of Canada

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the Annual Report of the Department of Mines and Resources for the fiscal year ended March 31, 1949.

Respectfully submitted,

COLIN GIBSON,
Minister of Mines and Resources.

The Honourable Colin Gibson,
Minister of Mines and Resources,
Ottawa.

SIR:

I have the honour to submit the Thirteenth Annual Report of the Department of Mines and Resources, covering the fiscal year which ended on the 31st of March, 1949.

Your obedient servant,

H. L. KEENLEYSIDE,
Deputy Minister.

Report of the Department of Mines and Resources for the Fiscal Year Ended March 31, 1949

A gratifying feature of the year's activities was the increasing desire displayed by industry to make full use of the facilities provided by the Department for the solution of industrial problems. Results obtained were improvements in plant practice, development of new uses for various products, and extension of market outlets.

This report shows that practical co-operation in a number of directions is being extended by the Department, not only to Canadian authorities and agencies but to various international organizations as well. This co-operative activity is not confined by any means to well-established functions such as those performed by the International Boundary Commission and those involved in the regular exchange of navigational data with other countries. In geodesy, geophysics and geology, departmental officials participated in international conferences in Norway, New Zealand and the United Kingdom. Material was prepared as well for such United Nations bodies as the Scientific Conference on the Conservation and Utilization of Resources and the Food and Agriculture Organization.

Another outstanding feature of this report is the clear indication of a steadily growing measure of co-operation between Departmental and Provincial Government authorities in many fields of Federal-Provincial interest and concern. In regard to forestry, forest production, highway construction, surveys in connection with waterpower development, air and other types of mapping, and in hydrometric work, the effectiveness of this increasing degree of mutual assistance and co-operative effort has been demonstrated in practical fashion.

Flood emergency conditions in British Columbia during the early part of the fiscal year provided a significant example in this connection. A particularly valuable service was rendered by the Vancouver office of the Dominion Water and Power Bureau which, in the crisis, became the centre of all information concerning water levels throughout the province. A similar service was rendered to Manitoba by the Winnipeg office of the Bureau in connection with spring floods on prairie rivers.

The growth of Yellowknife and district has brought into sharp focus the number, variety and importance of Mines and Resources services contributing to the long-range development of the whole of Canada's new North. Varied activities engaged in during the year were the building of local roads, precise mapping of large areas, intensive surveys leading towards proper conservation and use of wildlife resources, construction of the Snare River power project, hydrometric surveys of Great Slave Lake and the completion, in collaboration with Alberta, of the key Mackenzie Highway. Improved educational facilities have been provided in the Mackenzie District. These features of one year's report are in addition to technological assistance made available by the Mines Bureau of the Department to the mining industry of the Yellowknife area.

Visitors to the National Parks reached the highest figure ever recorded in any fiscal year, the total representing an increase of ten per cent over the previous year. A satisfactory beginning was made on a broad program of park highway improvement and extension.

The last day of the fiscal year under review marked the entry into Confederation of the new Province of Newfoundland. In preparing for this transition, preliminary measures were taken by various branches of the Department. Since provisions of Canada's Immigration Act automatically came into effect in Newfoundland at the date of Union, arrangements were made in advance, in consultation with Newfoundland officials, to staff and operate ports of entry in the new province.

Newfoundland's entry added six thousand miles of coastline to Canada, substantially increasing the responsibilities of the Canadian Hydrographic Service. Plans were completed to extend without delay the territory served by the Halifax office of the Dominion Hydrometric Service to include Newfoundland.

Recent oil and gas developments in Alberta have produced results of foremost importance to the mineral industry of Canada. Oil discoveries during the fiscal year in that province represent new and unparalleled possibilities for Canadian industry. The resulting demand for authoritative information concerning drilling and exploration areas has been met by departmental officials. Pilot plant experiments continue to be directed towards the economic separation of bitumen from tar sand deposits. There are definite indications, supported by considerable geological and other evidence, that Canada will become self-sufficient in oil. A careful study of the natural gas resources of Western Canada, recently completed by the Department, indicates reserves well in excess of four trillion cubic feet.

Unmapped areas in Canada's northland are constantly being filled in as the vast program of aerial photography unfolds. The Air Survey section increased map production by 95 per cent in the fiscal year. Map production in all its branches has increased remarkably during the fiscal year, to keep pace with an extraordinary public demand.

The number of immigrants admitted to Canada during the fiscal year was 125,603, an increase of 58·6 per cent over the corresponding figure in 1947-48. In spite of the retarding influence of international exchange difficulties, there was a continuing active interest in migration to Canada from the United Kingdom and western Europe. A Settlement Service has been established within the Branch to link up placement opportunities in Canada with agriculturists, small industrialists and business men, and scientists, interested in coming to this country.

Continuing progress was made towards establishing for Canadian Indians opportunities equal to those of fellow Canadians of the white race. Economically the Indian shared in the prosperous conditions enjoyed by the nation as a whole. Twenty-four new day schools were constructed and extra classrooms added to existing schools. The practice was resumed of holding in Ottawa conferences of field officers of the Branch.

Significant steps were taken during the fiscal year towards the establishment of a Trans-Canada Highway. A conference in Ottawa of Provincial Premiers and Ministers, called by the Minister of Mines and Resources, was held on December 14 and 15.

The following tables give a summary of revenues and expenditures for the fiscal year:—

Summary of Revenues and Expenditures for the Fiscal Year 1948-49

—	Revenue	Expenditures		
		Ordinary	Special including Demobilisation and Reconversion	Total Expenditures
	$ c.	$ c.	$ c.	$ c.
Administrative Office	3 95	354,820 38	1,450 00	
Special Projects	34,475 77	126,350 78		
	34,479 72	481,171 16	1,450 00	
				482,621 16

Summary of Revenues and Expenditures for the Fiscal Year 1948-49

—	Revenue	Expenditures		
		Ordinary	Special including Demobilization and Reconversion	Total Expenditures
	$ c.	$ c.	$ c.	$ c.
Mines, Forests and Scientific Services Branch—				
Branch Administration	11,415 39	9,532,008 36[1]		
Bureau of Mines	17,794 23	1,476 411 73	81,893 25	
Geological Survey	6,991 86	941,128 49		
Surveys and Mapping Bureau	58,474 11	3,083,083 27	851,111 22	
Dominion Forest Service	9,587 33	1,675,693 51	10,791 09[2]	
Water and Power Bureau	63,443 00	714,993 20		
National Museum of Canada	.....	144,177 93		
Dominion Observatories	21 80	308,040 06		
Geographical Bureau	1 00	99,155 99		
	167,728 72	17,974,692 54	943,795 56	
				18,918,488 10
Lands and Development Services Branch—				
Branch Administration	.....	46,030 40		
Northwest Territories and Yukon Services	34,048 67[3]	3,242,119 72		
Lands Division	658,762 64[4]	221,253 50	45,259 94	
National Parks Service	630,162 08	7,753,262 69		
Dominion Wildlife Service	102,415 38	196,254 06		
Engineering and Construction Division	67 67	404,592 01		
	1,425,456 44	11,863,512 48	45,259 94	
				11,908,772 42
Indian Affairs Branch—				
Branch Administration	.....	124,825 43		
Indian Agencies—Administration	35,070 06	1,845,061 46		
Reserves and Trusts—Administration	360,220 25	162,972 17	197,769 04	
Welfare of Indians	10,822 95	2,367,233 82		
Indian Education	3,620 10	5,403,012 24		
Miscellaneous Statutory Items (Annuities and Pensions)	1,960 00	319,653 00		
Reimbursement to Blackfoot Band	.....	156,669 00[5]		
Miscellaneous Revenue—not including revenue accruing to Indian Band Funds	21,075 49			
	432,768 85	10,379,427 12	197,769 04	
				10,577,196 16
Immigration Branch—				
Administration of the Immigration Act	.....	590,211 92		
Field and Inspectional Service—Canada	.....	2,744,757 27		
Field and Inspectional Service—Abroad	.....	1,155,953 90		
Immigration-by-Air Plan	.....	1,072,542 96		
Miscellaneous Statutory Items	.....	4,520 00		
Demobilization and Reconstruction—Miscellaneous	.....	.....	43,014 69	
Miscellaneous Revenue	180,391 08			
	180,391 08	5,567,986 05	43,014 69	
				5,611,000 74
Totals for Department	2,240,824 81	46,266,789 35	1,231,289 23	47,498,078 58

NOTES—

[1] Includes an amount of $9,433,493.86 paid to gold mine operators under the Emergency Gold Mining Assistance Act.

[2] This amount is a Reconstruction and Supply vote for Forest Insect Control Board.

[3] Amount received from profits on sale of liquor and for liquor fines in the Northwest Territories are not included but are deposited to the Trust Account, Liquor Profits-N.W.T. The credit balance in that account at the close of the fiscal year was $572,904.11.

[4] Includes $44,666.06 to offset similar amount reported as expenditure and covering amounts written off during the year from outstanding advances for Seed Grain and Relief.

[5] To reimburse the Blackfoot Band of Indians for an expenditure in 1930 out of band funds for the reconstruction of the Old Sun Residential School with interest at 5% per annum.

Special Projects

J. M. Wardle, Director

This Branch continued its special activities, including highway projects, power projects, International Boundary Commission and the Eastern Rockies Forest Conservation Board.

Highway work was featured by the completion of two major highway projects, the Grimshaw-Great Slave Lake Highway in northern Alberta and the Northwest Territories and the Snow Lake mining road in Manitoba. The completion of the Grimshaw road afforded the first all-weather road leading from Grimshaw on the Northern Alberta Railway to Hay River Settlement on the south shore of Great Slave Lake. The Snow Lake mining road afforded adequate overland transportation from the railway station at Wekusko, Manitoba, on the Hudson Bay Railway to mining properties in the Snow Lake district, a distance of 35·5 miles.

An event that will be significant in the development of the Northwest Territories, was the completion and placing in operation of the hydro-electric power plant at Snare River, 95 miles northwest of Yellowknife.

Highway Construction

Grimshaw-Great Slave Lake Highway

The length of this road is 385 miles, of which 304 miles are in Alberta and 81 miles in the Northwest Territories. As 69·5 miles of the provincial section had been previously built, the uncompleted section in Alberta when work began in 1946 was 234·5 miles long.

The construction of the provincial section was on a joint basis with Alberta, the Dominion contributing two-thirds of the actual cost of the work up to a maximum Dominion contribution of $1,375,000. The total of the Dominion contribution was reached in the middle of the 1948 construction season. Engineering costs on construction were shared under the same arrangement. The highway was completed throughout by October, 1948, and provides a very satisfactory overland transportation route to Great Slave Lake where freight and personnel can be taken to Yellowknife by barge and boat. The road is open all winter and the amount of traffic over it is steadily increasing.

During the winter, large shipments of fish were transported over the road by truck from Great Slave Lake to the southern markets. The existence of this road has greatly facilitated the search for minerals, particularly base metals in the area south of Great Slave Lake.

Both the Dominion and Provincial sections of the road were built to the same specification, namely, a road bed 20 feet wide surfaced with gravel. The Dominion section has more surfacing material per mile than the Provincial section and the latter may require some additional maintenance expenditure on low sections. The total cost of construction of the Provincial section to March 31, 1949, is approximately $2,851,870.30.

The Dominion section through the Northwest Territories combines a well gravelled surface with grades and alignment of high standard. The total cost of this 81 miles of road was $1,559,754.44.

Construction operations on the highway included: cutting and clearing, 1,059 acres; solid rock, 20,651 cubic yards; other material, 1,095,629 cubic yards; gravel surfacing, 144,749 cubic yards; and timber bridges built, 4.

Snow Lake Mining Road

Snow Lake mining road was a joint project with the Province of Manitoba, the agreement providing that the Dominion would contribute one-half the estimated cost of the 35.5 miles of road up to a maximum of $250,000. As it was found impossible to obtain satisfactory prices for work by contract this project was built by day labour under the immediate direction of the Public Works Department of the Province of Manitoba. This project was satisfactorily completed in the 1948 season. As the cost of the work was higher than estimated by the province, the Howe Sound Exploration Company who were developing the Snow Lake mining properties contributed $150,000 to construction costs of which $75,000 was earmarked for Dominion contributions, if required, and a similar sum for the provincial contribution. The total expenditure on the project up to March 31, 1949, was $686,895.24, of which the Dominion contributed $249,999.80 plus $75,000 of the mining company's grant or a total of $324,999.80.

Trans-Canada Highway

Increasing public interest in this national project resulted in the Director of Special Projects and his staff giving considerable attention to what this project involved in terms of planning, provincial co-operation and expenditure. At the same time, information was collected from the various provinces on the status of existing roads that might form part of the Trans-Canada route, on estimates of costs, and on comparative mileages of alternative routes. The latter question was an initial concern of the provinces and was given a good deal of publicity in Alberta and British Columbia where there were advocates of three main routes, these being the Yellowhead Pass, Kicking Horse Pass, and Crowsnest Pass.

The Minister of Mines and Resources called a conference of provincial Premiers and Ministers in Ottawa on December 14 and 15 to discuss the Trans-Canada Highway. The preparatory work for this meeting was mainly undertaken by the Special Projects staff, and involved the collection of a large amount of road data and estimate figures and the preparation of suitable maps.

At the meeting, all the provinces expressed a great interest in the highway and hoped for its early completion. Provincial representatives also indicated the route through their respective provinces that they preferred, these connecting without loss of direction with the route through adjacent provinces.

Following the conference, the provinces were asked to submit definite information on their selective routes together with estimates of cost, construction time, and specifications. All the required information had not been obtained at the end of the fiscal year.

Following the conference, preliminary steps were taken on the drafting of a Trans-Canada Highway Bill under which the Dominion would be authorized to assist the provinces financially under certain terms and conditions. This Bill was not ready for presentation to the House of Commons before the House was dissolved.

Victoria-Patricia Bay Airport Road

This project involves the improvement or reconstruction of 17 miles of road connecting the city of Victoria with the airport and air-harbour at Patricia Bay. The Dominion and the Province of British Columbia agreed to contribute equally to the cost of necessary surveys, the Dominion expenditure not to exceed $4,000. The survey work was under the direction of the Public Works Department of British Columbia and began in March.

The first work undertaken was an examination and survey of 13 miles of abandoned railway grade which, if converted to highway standards, might give a satisfactory high-standard road for the greater part of the distance involved.

The alternative was to widen and improve the existing road which served all the adjacent area in addition to the airport and was subject to heavy cross-traffic.

Investigations showed that the abandoned railway grade did not offer a wholly satisfactory solution and further survey was required to see what might be done towards improving and straightening the existing road. No decision had been reached at the end of the year.

Power Projects

Snare River Power Development

The Snare River storage and power project was completed about four weeks ahead of schedule and within the estimated cost. Tests of the powerhouse equipment and transmission line were made throughout September, and the plant was officially opened and commenced delivering power on October 4.

A description of the main features of this development were included in the Annual Report for the year ended March 31, 1948, and a full report on the project is given in the report of the Northwest Territories Power Commission for the fiscal year ended March 31, 1949. Consequently, this report is limited to main features of the project.

The Snare River development was initiated as a departmental project under the Surveys and Engineering Branch. As it was the intention that the plant, including transmission lines and sub-stations, should operate on a self-sustaining basis, provision was made for this by the passing of the Northwest Territories Power Commission Act in June, 1948. This provided for the establishment of a Commission that would be responsible for the completion and operation of the hydro-electric development.

The Northwest Territories Power Commission took over the entire project on September 1, and by September 30 the main contract was completed to the extent that further work could be economically done by day labour under Commission supervision.

Up to the end of the year operation of the plant was satisfactory and power was steadily supplied over the winter months. The investment in this project, including transmission line and sub-stations, from its inception up to March 31 amounted to $4,485,295.24.

Fort Smith Power Development

In January, plans were commenced for the installation of a diesel generating plant to supply the electric power required at Fort Smith, N.W.T. At present three Government departments operate separate diesel plants, and it will be in the interests of economy and operating efficiency to have the present and future departmental and local needs filled by one central plant.

Plans are underway to build the power-house and part of the distributing system in the 1949 construction season, and to complete the project in 1950, by which time the diesel engines, generators and switchboards will have been delivered and installed.

Mayo River Power Development

In co-operation with the Dominion Water and Power Bureau consideration was given to the development of a hydro-electric power plant on the Mayo River, Yukon Territory, which would supply power for the silver-lead mines that are operating or being developed in the Keno Hill District. Approval was obtained for surveys and investigations to be made at an estimated cost of $10,000. Arrangements were completed for the survey party to commence work before the end of April, 1949.

Eastern Rockies Forest Conservation Board

This Board was established in the autumn of 1947 under the authority of the Eastern Rocky Mountain Forest Conservation Act, passed by the House of Commons in July, 1947, and ratified on behalf of Alberta by its legislature in March, 1948.

Under the Act and appended Agreement, 8,585 square miles on the eastern slope of the Rocky Mountains in Alberta becomes the responsibility of the board for all matters related to forest protection and development. This includes the construction and maintenance of roads and other projects and facilities required to conserve the forests of the area and maintain the greatest possible flow of water in the Saskatchewan River and its tributaries.

The three members of the Board are: Howard Kennedy, C.B.E., M.C., B.Sc., chairman; J. M. Wardle, C.B.E., B.Sc., Dominion member; and H. G. Jensen, LL.B., Alberta member.

As the work of the Board has been covered in its own report, only a summary of its operations will be given here.

A general policy for road construction was established. This called for a main trunk road with 20′ top, joining the Crowsnest, Bow River, and Clearwater Forests, and following as closely as possible the north-south central axis of these forests. Class B or secondary roads were to be largely lateral roads with 14′ top, and Class C roads were to be modified trails suitable for use by jeeps or small tractors in emergencies..

Despite the late spring of 1948 and the organizational difficulties of commencing the road construction program, 24 miles of secondary road and seven miles of main road were constructed during the open season by day labour. Culverts, piling and bridging materials were stockpiled to facilitate next year's work. Construction equipment purchased by the Board during this year will allow for some 40 miles of road construction by day labour during the next season, in addition to the sections for which contracts will be let.

Surveys were completed during the year that will enable the letting of contracts for the construction of 70 miles of road in 1949, and sufficient survey equipment was on hand at the end of the fiscal year to permit six full survey parties to be placed in the field in the open season of 1949.

The Board's Forestry Division is a technical staff auxiliary to the functions of policy making. It secures information on which policy is based, and works out the methods required to carry out the policies, and observes their execution. The field force in the Reserve area, from superintendents to rangers and lookout men, are members of the Alberta Forest Service, and are responsible for detection and suppression of fires, for day to day administration of the area, and for carrying out the Board's policies.

The fire loss during 1948-49 was low. In the summer, the Board commenced a program of visible area mapping from lookouts to obtain a better picture of the requirements for a fully effective ground detection system. Large scale tests for the installation of a radio network were carried out. Experimental planning and studies of grazing effects were undertaken. Cutting regulations were revised in co-operation with the Alberta Forest Service, and type mapping of all the forested areas was started by the Dominion Forest Service at the Board's request.

International Boundary Commission

Although the original definition of the boundary line between Canada and the United States was included in the treaties of 1783, 1814 and 1846 between the Governments of Great Britain and the United States, and that of the boundary line between Canada and Alaska in the treaty of 1825 between Great Britain and Russia (the definition in this treaty being repeated in the treaty of 1867 by which the United States acquired the territory of Alaska from Russia), a number of additional treaties and several international commissions were found to be necessary to settle details in dispute relating to the interpretation of the provisions of these early treaties. Until 1925, however, no provision was made for the future maintenance of the boundary line when the surveys and demarcation required by the various treaties had been completed.

Under the provisions of the treaty of 1925 between Canada and the United States, the International Boundary Commissioners, one for Canada and one for the United States, appointed under the treaties of 1903 and 1908, were re-appointed "in order to provide for the maintenance of an effective boundary line between the Dominion of Canada and the United States and between the Dominion of Canada and Alaska." The treaty further stipulated:

> "The said Commissioners shall submit to their respective Governments from time to time, at least once in every calendar year, a joint report containing a statement of inspections made, the monuments and buoys repaired, relocated, rebuilt, moved and established, and shall submit with their reports, plats and tables certified and signed by the Commissioners, giving the locations and geodetic positions of all monuments moved and all additional monuments established within the year, and such other information as may be necessary to keep the boundary maps and records accurately revised."

Each Section of the Commission has its own staff of engineers, draftsmen and stenographers. Under the treaty, expenditures for the maintenance of the boundary are shared equally by the two countries but each country pays the salaries and travelling expenses of its own Commissioner and his assistants. The Commissioners meet at least once annually to co-ordinate the work of the two Sections of the Commission, to sign letters of transmittal and certificates for their annual joint reports, to sign joint statements of divisible expenditures, to arrange for their trips of inspection to the various sections of the boundary line, and to discuss boundary matters in general.

Conference of the Commissioners

In 1948 the Commissioners, J. M. Wardle for Canada and John A. Ulinski for the United States, held their first meeting for the year in Washington from April 27 to April 29. They agreed that the inspection and repair of the boundary monuments and the reclearing of the vista at the boundary crossings of the Kelsall and Tahini Rivers near Haines, Alaska, and along the 49th Parallel from Columbia Valley to Point Roberts on the Pacific Coast, should be undertaken by parties of the Canadian Section; and that similar work at the boundary crossings of the Iskut and Katete Rivers, and the continuation of the inspection and repair of reference monuments eastward from Laurel, Minnesota, on the Ontario-Minnesota boundary, where work was stopped in 1947, should be undertaken by parties of the United States Section. Among other matters discussed was the condition of the offshore range marks at Point Roberts, which are deteriorating. It was agreed that an investigation should be made for the replacement of these range marks.

Inspection by the Commissioners

On August 5 the Commissioners met at Detroit, Michigan, for an inspection trip by boat along the boundary through St. Clair River, St. Mary River and Pigeon River, noting the condition of a number of the boundary reference monuments on the way. Two were found completely out of place. No. 48, on the St. Clair River, near Corunna, Ontario, had been undermined by the river, and No. 57, at Point Edward, Ontario, had been broken and moved out of place by the operations of a contractor in removing sand from the beach. Bridge tablets on the Blue Water bridge and reference monuments and bridge tablets inspected on St. Mary River were found in good condition. From Port Arthur inspection of the boundary through Pigeon River was made by automobile. Bridge tablets and reference monuments were found to be in good condition, except reference monument No. 1364 near the mouth of the Pigeon River, which was found to require repairs to the concrete base.

Maintenance of the Boundary

The boundary areas in southeast Alaska are difficult of access. The most practicable means of travelling to them is by boat or canoe up the swift glacial streams which cross the boundary on their way to the ocean. For the transportation of the Canadian field party to the tributaries of the Chilkat River a river boat was chartered, in which the party was taken from Wells, 24 miles by motor road from Haines, to the mouth of the Tahini River, about 20 miles from Wells as scaled on the map but considerably farther by the winding course the boat was forced to take to avoid the sand and gravel bars in the shallow bed of the river. Before the Tahini River could be ascended, it was found that partly submerged fallen trees would have to be blasted by dynamite to clear the channel.

Camp was established on a knoll near the mouth of an unnamed creek on the west side of the Tahini, which for convenience was named Eaton Creek, after D. W. Eaton, assistant to J. A. Flemer, engineer in charge of the United States party which surveyed the area and marked the boundary across the Tahini River in 1905. Above camp the river was a mountain torrent, swollen by the rapidly melting snow on the mountains and glaciers. A trail was cut through the dense growth in the valley and foot bridges were constructed across the mountain creeks for about two miles to the boundary. There the old vista cutting had become completely filled in, but the monuments at the sides of the Tahini River were found after a short search.

The vista was cleared for about one-half mile up the steep side of Boundary Peak 128 to the tree line on the east side of the river. It was continued westward across the west fork of the Tahini, which is now named Flemer River, and across several large creeks between the heavily wooded knolls for about four miles to Monument 132, at tree line on the slope of Boundary Peak 134. At the Flemer River the boundary line crossed just above the falls which were visible from the camp, and on the west side of the river there was a prominent land mark in the form of a pyramid about 15 feet high. The growth in the vista was mostly spruce and balsam on the tops of the knolls, and alder and birch in the hollows. In accordance with the present practice of the Commission, the monuments from No. 129 on the east side of the Tahini to No. 133 about three miles west of the tree line on the slope of Boundary Peak 134 were marked by hand drill with their consecutive numbers.

The Kelsall River joins the Chilkat about 10 miles above Wells. The rapidity of its current makes boating impossible on it. At the confluence of the two rivers the Chilkat is very wide, with a large number of shallow channels flowing between silt-formed islands, which makes the approach to the Kelsall

difficult. At flood stage a boat can be taken to the north shore of the Chilkat a mile or so east of the Kelsall, but at ordinary water level about a mile of grass covered marsh has to be crossed before the shore can be reached.

The two mules which had been used for packing by the maintenance party of 1947 were transported by boat from Wells to the camp at the beginning of the 12-mile trail up the Kelsall River valley to the boundary. This trail was found to be blocked in many places by fallen trees and quickly growing devil's club, and completely obliterated in part by slides down the steep mountain sides. Furthermore, the bridge built across the river in 1947 had been destroyed by flood. A new bridge was constructed. Four 75-foot spruce timbers formed the stringers, two projecting from each side of the river, and roughly hewn planks formed the floor. Upon completion of the bridge and repairs to the trail, camp was moved to within a mile of the boundary. From this point a foot trail was slashed through dense alders until the line was intersected near Monument 138.

The river at the boundary flows through a canyon, consequently the vista cutting there was difficult and dangerous work. Westward from the river the vista was cut up the steep slope past Monuments 137 and 138 and continued up the slope to the edge of the alders. These monuments, together with No. 139 on the clear rolling ridge to the westward, were marked with their respective numbers and the party moved camp back to the bridge to work on the east side of the river.

From the bridge a foot trail was made through the dense growth on the rugged mountain-side east of the river for about four miles to the boundary. There the old vista was easily found, the growth being mostly large spruce and hemlock. Numbers were also inscribed by hand drill on Monuments 135 and 136 on this side of the river.

Bears were a constant menace to supplies on the Kelsall River. While the party was working on the bridge a large grizzly broke into the cook tent at the base camp and devoured some supplies, including a cake of soap, before it was shot by the packer. It took the efforts of four men to drag the carcass to the side of the trail. A week later it was found that wolves had left nothing but its bare bones.

The Commissioner and the Engineer to the Commission of the United States Section arrived in Haines and visited the engineer in charge of the maintenance party on the Kelsall and Tahini Rivers in July. A trip was arranged to take them in the river boat up the Chilkat River as far as the boundary area in the vicinity of Boundary Peak 142.

About 10 miles of boundary line were inspected, 10 boundary monuments were numbered and eight miles of boundary vista were cut on the Kelsall and Tahini Rivers.

The maintenance party on the British Columbia-Washington boundary established their first camp in Columbia Valley, a few miles south of Chilliwack, and worked westward across Vedder Mountain. On the face of the bluff below Monument 31, just west of Huntingdon, where brush had been planted by a maintenance party in 1935 to prevent erosion, another part of the bluff was found to be eroding, so brush was similarly planted there. Between Monuments 9 and 10 there were two intervening ridges. Two cedar posts were placed to make the line easier to find in this area, one on the first ridge west of Monument 10 and the other at the end of a truck road. Monument 6 was found to be at the edge of a ditch with the north side of its base partially exposed; a retaining wall of logs was built there to prevent further erosion. Most of the

monuments from No. 2 to No. 44 were given two coats of aluminum paint to preserve them from rust. At the end of the season, the condition of the range towers at Boundary Bay and Point Roberts was noted for the information of the Commissioners.

From Columbia Valley to Point Roberts 47 miles of boundary line was inspected. Of the 44 monuments inspected three were repaired, and about 25 miles of vista was cut.

Miscellaneous

Various sets of maps, the geographic positions of boundary monuments and triangulation stations, and a number of photographs of boundary areas were supplied to other branches of the Department. In addition, maps and various sorts of information regarding boundary matters were sent to the Department of National Defence, the Surveyor General of Ontario, the Surveyor General of British Columbia, the United States Immigration and Naturalization Service, and to a great number of private individuals.

Mines, Forests and Scientific Services Branch

W. B. Timm, Director

The past fiscal year was marked by several developments of outstanding interest and importance in the mining and forestry industries, the two primary industries served by the Branch. With high base metals prices as a chief contributing factor the mineral industry established a record in the value of its output which amounted to more than $810,000,000. Newsprint production set a record of approximately 4,600,000 tons and the production of lumber, estimated at 5,125,000 M. board feet, was only slightly lower than in 1947, the record year.

In the matter of export trade, so vital to Canada's economic well-being, the two industries continued to play a leading role. The sale abroad of wood, wood products, and paper yielded more foreign exchange in 1948 than any other two industrial groups combined. Canadian forest products sold in the United States in 1948 yielded more than $750,000,000 in American exchange. Sales of metals and minerals and their products abroad in 1948 reached $491,000,000, the value of the exports to the United States being $224,000,000.

Top-ranking development in the mineral industry was the continued success of drilling operations in new oil fields in Alberta. To a country long dependent upon outside sources of supply for 90 per cent or more of its crude oil requirements, recent developments in Alberta are without parallel in Canadian industrial history. So much has been crowded into such a relatively short space of time that it is difficult to appraise the full importance and significance of these developments to the Canadian economy. By the end of the fiscal year, however, a self-sufficiency of crude oil for the Prairie region seemed to be definitely established. There were hopes, supported by considerable geological and other evidence, of an eventual self-sufficiency in oil for Canada as a whole. The success or otherwise that may follow a search for oil is seldom predictable, but present indications are that Canada's dependence upon foreign supplies will be greatly lessened in the years ahead. This dependence in 1948 resulted in an expenditure of more than $190,000,000 for imports of crude oil to meet domestic requirements.

These developments in Alberta, particularly the finding of large fields such as Leduc and Redwater, have brought about an unprecedented development program. The area from Edmonton north to Athabasca and for a considerable distance beyond has been taken up either by permit or lease and many wells are being drilled. Not only is a large increase in production anticipated for 1949, but there is to be considerable expansion of refining facilities.

Canada seemed also to be on the threshold of natural gas developments that may have far-reaching effects on the economy of the country and that, in large part, are closely related to the aforementioned oil developments. In Alberta, developments in 1948 tended to further demonstrate that enormous natural gas reserves can be developed. Excluding the Pincher Creek field where gas was discovered in 1948, an estimate of the developed natural gas reserves of the Prairie Provinces as computed by Hume and Ignatieff of the Mines, Forests and Scientific Services Branch as of November 30, 1948 was 4·3 trillion cubic feet, an increase from April, 1948, of 600 billion cubic feet. Only wells adding further reserves to partly developed fields were considered in the

estimate and all isolated wells in which gas supplies had been measured or observed were excluded because of lack of data on the size of the possible new fields that such wells might indicate. A consideration of these wells, however, strongly supports the conclusion that the potential gas reserves of the Prairies are probably many times the developed reserves.

In mining also there was evidence of vigorous activity and solid accomplishment, much of it the result of progressive increases in the prices of lead, zinc, and copper throughout 1948. Seldom if ever before was there a greater demand for these metals. Near the end of the fiscal year, however, the demand began to slacken, indicating that consumers had acquired large supplies and were withholding orders in anticipation of a price decline.

Meantime, the high prices proved to be a powerful stimulus in the search for new sources of the metals and in the exploration and development of base metal properties toward production. Among the noteworthy developments in reference to these activities was the granting of a concession by the Federal Government to Northern Lead Zinc Limited in association with the Consolidated Mining and Smelting Company of Canada Limited, and Ventures Limited of a 500-square mile area surrounding the lead-zinc deposit at Pine Point on the south shore of Great Slave Lake. Extensive drilling exploration under direction of Consolidated Smelters was commenced in an attempt to disclose new orebodies. Another was the entry into production early in 1949 of the East Sullivan copper-zinc-gold mine in western Quebec, with a mill having a daily capacity of 2,000 tons. In the Noranda area in the same province Quemont Mining Corporation expected to have its 2,000-ton mill in operation by mid-1949 for the production of copper-zinc, and pyrite concentrates. In southern British Columbia, Reeves-MacDonald Mines Limited was building a 1,000-ton mill to treat its lead-zinc ore and also expected to commence production during the first half of 1949.

Elsewhere in widely scattered areas smaller properties, some of which had been idle for years, were being prepared for production.

At other less-advanced base metal properties, concerted efforts were being made by surface and underground exploratory work to determine the character and dimensions of deposits. An illustration of this was the drilling done by Noranda Mines Limited on a property in Gaspe which disclosed 6,000,000 tons of additional copper ore, bringing the total indicated by drilling to 40,000,000 tons. Another is the work that has been underway for the past few years at Lynn Lake about 150 miles north of Sherridon, Manitoba, where Sherritt-Gordon Mines Limited has disclosed about 8,300,000 tons of copper-nickel ore. A shaft to develop four of the five orebodies was being sunk in 1948.

The effect of the base metal price increases is perhaps seen to best advantage in the production and export figures. Production of nickel, copper, lead and zinc established a record value of $318,117,000, and exports a record of $225,667,000, the comparable figures for 1947 being $253,079,000 and $174,079,000, respectively. Exports to the United States in 1948 were valued at $117,886,000.

The increase in the value of gold production from $107,458,000 in 1947 to $123,466,000 in 1948 was particularly encouraging in view of the depressed state of the industry in recent years. This increase resulted largely from further improvement in the supply of labour and from the cost-aid assistance provided under the Emergency Gold Mining Assistance Act which came into force June 15, 1948. Briefly, the Act authorizes the Minister of Mines and Resources to make assistance payments to operators of primary gold mines in respect of gold produced from their mines and sold to the Royal Canadian Mint, or exported from Canada and sold during 1948, 1949, and 1950. Eighty-four mines submitted

applications during the fiscal year and the assistance payments, together with the holdback, amounted to approximately $8,700,000. The assistance payments were made on 87·4 per cent of the 1948 production of gold, the average assistance payable per ounce of gold being $3.18.

Comparable in importance to the aforementioned oil developments and, like them, indicative of Canada's expanding mineral economy, were the developments in relation to iron ore, titanium, and uranium.

Prominent among these was the proving of 300 million tons of iron ore in the Quebec-Labrador area, the tonnage considered necessary to warrant construction of a 350-mile railway from the deposits to the port of Seven Islands on the Gulf of St. Lawrence. By the end of 1948, 28 separate orebodies had been drilled and proved, all of which are high grade and of economic size, the largest containing 45 million tons. The substantial tonnage of manganiferous ore now proved is particularly interesting. Although no body of manganese has been proved as yet, outcrops of material high enough in manganese to be classed as ore have been found in a number of places.

Meantime, the Steep Rock and Helen iron mines in Ontario, the only Canadian sources of iron ore output at present, were preparing for a considerable increase in production. Most of the ore is exported to the United States as it is found to be economical to use ores from that country, mixed with a small proportion of Canadian ore, in the blast furnaces of Ontario.

Developments at Allard Lake, 22 miles north of Havre St. Pierre in Quebec seem to indicate eventual leadership in the production of titanium pigments and metal. The deposit has been tested by drilling and contains upwards of 200 million tons of titanium ore. A 27-mile railway is under construction from Havre St. Pierre to the orebody. Present plans for mining ilmenite at Allard Lake and treating it in a smelter to be built at Sorel, Quebec, are related only to the production of titanium dioxide pigment. When a suitable process for the economic production of titanium metal has been worked out there is no doubt that the output of ilmenite from the mine and of its products from the smelter will be increased.

Few events in mining during the fiscal year aroused greater interest than did the search for new sources of uranium. Hundreds of prospectors were engaged in the search which lacked little of the colour and glamour usually associated with the search for gold. Reminiscent of the gold rush into the Red Lake area more than 20 years ago was the staking rush that followed the discovery of pitchblende at Canray near Sault Ste. Marie, Ontario, in the autumn of 1948. Two other pitchblende discoveries were reported in the area late in 1948. However, with winter ahead, most of the attention in the region was given to the staking of claims. Otherwise, chief interest was centred in the Goldfields area of northern Saskatchewan where the Crown-owned Eldorada Mining and Refining (1944) Limited has a large block of claims on which it has made several important discoveries of pitchblende. The company was doing underground work on one of its properties and has diamond drilled several other properties. Several privately owned syndicates and many prospectors on their own were active in the area.

In the same area, Nicholson Mines Limited did further drilling and surface work on its property, as a result of which it planned to commence shaft-sinking in 1949.

At Black Lake, 120 miles east of Goldfields an important discovery of pitchblende was made in the autumn of 1948. Considerable prospecting activity was underway also in the Lac La Ronge area of Saskatchewan.

A spectacular staking rush followed the detection of radioactivity in August, 1948, in samples from the Little Gem property in the Bridge River area, British Columbia. Several years ago this property received some under-

ground exploratory attention because of the gold-cobalt content of the deposits. The checking of other previously known cobalt occurrences in the province resulted in the discovery of uranium in appreciable quantities at the Victoria property near Hazelton.

Operations at the Eldorado mine in the Northwest Territories continued as usual. The mine is the only present Canadian source of output of uranium ore. Consolidated Smelters did diamond drilling on its holdings adjoining Eldorado, and International Uranium resumed underground exploratory work on its property nine miles southeast of Port Radium.

Former pitchblende discoveries in the Hottah Lake area were dormant.

Some exploratory attention was given to a discovery about 100 miles northwest of Yellowknife. Discoveries in the Barnston River area about 100 miles east of Yellowknife led to the staking of about 300 claims.

In Ontario, further prospecting was done on the Mosher occurrence north of Cochrane that was discovered in 1947. Interest in the district waned, however, when it was found that the radioactivity was caused by thorium rather than by uranium. Further surface work was done on properties in the Wilberforce area.

In the industrial mineral group there were few developments of outstanding interest, a notable exception being the discovery of chrysotile asbestos near Matheson in Munro township, Ontario. Although public announcement of this came late in the fiscal year, the discovery is of major importance and will greatly enhance the leading position Canada now holds as a producer of the mineral.

Including clay products and other structural materials, the value of output of industrial minerals in 1948 reached a peak of $164,000,000, compared with $139,000,000 in 1947, the previous peak year. Records were established in the output of asbestos, gypsum, salt, feldspar, nepheline syenite, and of the structural materials, and in the value of output of several of the minerals, including asbestos, gypsum, the structural materials, sodium sulphate, and peat moss. Canadian output of gypsum for the first time exceeded 3,000,000 tons and the value of output for the first time exceeded $5,000,000. Much the greater part of the output is exported in the crude state, mainly to the United States.

Like that of the metals the demand for most minerals of the group was seldom greater, and more particularly in reference to those used in the chemical and construction industries. Although production of cement in Canada in 1948 reached a peak of more than 14,000,000 barrels it was necessary to import 1,121,000 barrels to meet rising construction and engineering demands. Much of this demand arose from the construction of power sites, particularly in Ontario. Expansion of cement plants will increase present annual capacity by approximately 2,000,000 barrels a year. However, present indications are that this additional capacity will be insufficient to keep pace with the increasing demands.

Expansion in production capacity and modernization in production methods in the interest of efficiency were general also in the clay products industry. Since the war many new small plants have been established, particularly in Eastern Canada, and others are being established. The products made or to be made in these plants include hotel or restaurant ware, low tension electrical insulators, glassed wall tile, and art or novelty ware.

The salt industry also showed further tangible evidence of expansion. The new salt plant of Alberta Salt Company Limited, at Lindbergh, Alberta was brought into production; construction in Sarnia, Ontario, of the caustic soda-chlorine plant of Dow Chemical Company of Canada, Limited, was nearing

completion; and construction was commenced in Beauharnois, Quebec, of a similar plant by Dominion Alkali and Chemical Company, Limited. Ontario produced about 84 per cent of the Canadian output of salt in 1948, for use mainly in its expanding chemical industries.

Canada supplies a large part of its own requirements for industrial minerals, but imports of these minerals and their products have been increasing rapidly and now exceed in value that of the domestic production of a few years ago. This has directed attention to the possibility of greater utilization of active and potential Canadian sources of supply and there are indications that this attention will increase.

Marked improvement can be recorded also for the forest industry. Post-war conditions have placed this industry on a prime footing in the Canadian economy, and the forests now account for 31 per cent of the country's industrial wealth. As noted in the foregoing, they are Canada's chief source of dollar exchange.

The extraordinary demand for forest products that has prevailed since the war continued throughout 1948. The requirements for housing and other construction, together with exports, provided a stimulus for high production. However, there was a decrease in lumber exports to the United Kingdom and this resulted in lower production in Eastern Canada which was not quite offset by the increased production from British Columbia. Pulp and paper production continued to increase and exports of these products reached new high levels in 1948.

Lack of international purchasing power, coupled with an increased demand for Canadian forest products in the United States, has resulted in that country becoming Canada's main export market. Canadian exports of all goods to the United States in 1948 were valued at $1,501,000,000, of which pulp and paper accounted for $541,022,000, and lumber and other wood products for $213,916,000. In that year the United States absorbed 68 per cent of Canada's lumber exports, and in the first half of 1948 Canadian exports of pulp to the United States were more than double those from Scandinavia, the chief American source of supply prior to the war. Canada's own lumber needs amount to from 40 to 50 per cent of the country's output.

The lumber industry has benefited materially from a number of factors, including a new use for saw lumber in the manufacture of plywood, and the addition of facilities to saw-milling operations for manufacturing secondary products. Pulp and paper production has been increased by the extension of productive facilities, the replacement of outdated equipment in newsprint mills, the extension of the kraft method in pulp making, and by constant research in the utilization of raw materials.

A highly encouraging development was the increasing attention and recognition given to the matter of forest depletion by industry and Government. It is estimated that of the total depletion in the ten-year period ended 1945, about 74 per cent was utilized and 26 per cent was destroyed by fire, insects, and disease. Practically all of the depletion is concentrated in the 435,000 square miles of productive forest which is classed as accessible. In many sections of this area severe over cutting is taking place, whereas the annual growth is not being used on the less accessible areas. Efficient utilization is an important factor in depletion and there is little doubt that in the past a high percentage of the hewn logs was discarded. Changes have been taking place in the use of wood that permit of the use of sizes and qualities that are unmerchantable as sawn lumber. Development of the cellulose industry is rapidly extending the use of wood. Plastic wood products, fibre board, and laminated wood will doubtless provide an increasing outlet for certain classes of wood so that by the greater use of forest resources much of the waste that now occurs will be eliminated.

The losses through forest fires were again high, though not abnormally so, considering the country as a whole. However, Ontario had one of the worst fire seasons in recent history, and losses in Manitoba were the highest in 19 years. Conditions were close to normal in Quebec, Saskatchewan, Yukon, and the Northwest Territories, while in Alberta and British Columbia, fire losses were well below average. They were much below normal in New Brunswick, and were exceptionally light in Nova Scotia. Carelessness on the part of campers and others continued to be a main cause of forest fires.

The services provided by the Branch to the mineral and forest industries, and the various other activities now constitute a large and important field of endeavour in the Government Service. An additional major responsibility of the Branch is assistance in the administration of the Emergency Gold Mining Assistance Act.

Progress was maintained in all important directions and much was accomplished of immediate or long range benefit to industry. To keep pace with the needs of industry, several of the services were enlarged and additional services were established. Efforts were continued with good results to obtain highly qualified personnel in filling vacant geological, metallurgical, and engineering positions requiring specialized training and experience.

An increasing desire on the part of industry to make full use of the benefits of science was observed and in many of the projects industry actively participated in working out solutions to problems, resulting in improvements in plant practice, in the development of new uses for various products, and in the extension of market outlets.

The removal of government restrictions on private prospecting for and development of radioactive mineral deposits early in 1948 was reflected in the year's activities of the Geological Survey.

The interest and activity in the rapidly growing search for radioactive minerals resulted in the extension of the Survey's facilities and the organization of a separate staff to make investigations and to give advice and assistance to prospectors, mining companies, and others. The Chief Geologist of the Geological Survey was made agent of the Atomic Energy Control Board.

The unparalleled activity in the search for oil and natural gas, particularly in Western Canada, resulted in the receipt of close to 87,000 borings samples for filing and study.

To assist geologists engaged in oil exploration, three specialists were appointed to make thorough studies of the oil-bearing formations of Western Canada.

The staff of the Geological Survey's Geophysical section was increased to cope with the plotting of magnetic data acquired through the use of the airborne magnetometer. These surveys, which were made over large mineralized areas in western Quebec and eastern Ontario, totalled 15,100 square miles and required flights aggregating 57,100 line miles of magnetic profile, constituting about 500 hours of flying time.

Since its establishment in 1842 the Geological Survey has mapped about 27 per cent of the total area of Canada on various scales ranging from detailed mapping to reconnaissance surveys. Thus the task ahead is great and with the increasing development of the country there is increasing need for geological knowledge, mainly for mineral development purposes, but for agricultural, engineering, and other purposes as well. The Survey, for instance, anticipates a steadily increasing need in the years ahead for work on Pleistocene geology—such matters in particular as soil surveys and ground water supplies. Activities in this field of endeavour are being expanded.

The Geological Survey had 61 parties in the field in 1948. It is endeavouring to increase its geological staff to a point where it will be possible to place 100 parties in the field each year.

Canadian industry benefited materially from the work of the Bureau of Mines. Bureau engineers reported the solution of several baffling problems concerned with the efficient treatment of refractory gold ores in the Northwest Territories and in the Red Lake area of Ontario. In another project they worked out corrective procedures to reduce losses from mill tailings that several gold operators had been experiencing.

Research by the Bureau on radioactive minerals led to the development of a process for the treatment of low grade uranium ores; of a method of determining thorium in ores; and to development of a simplified method for the field analysis of ore by a standard Geiger field counter.

Exhaustive studies of coal mining methods and underground gasification in Canada and abroad were made to assist the coal industry in lowering costs, increasing production, and in conserving Canadian coal resources.

A pilot plant to separate bitumen from the bituminous sand of northern Alberta was ready for operation at the end of the fiscal year. Bureau engineers believe this process will give a product that can be transmitted by pipe-line and can be handled without difficulty in oil refineries.

The results of a study of winter welding methods indicated the practicability of structural steel welding in Canada under winter conditions. This method may eventually replace the present costly, time-consuming practice of riveting such structures.

Marked progress was made by the Bureau in the development of new alloys to meet exceptional service conditions. In co-operation with the National Research Council, it developed one such alloy which is now under test in jet engines. In a co-operative effort with the Industrial Advisory Committee on Magnesium Research, it developed a high strength magnesium casting alloy. Research aimed at finding suitable substitutes for such strategic alloying metals as chromium and manganese was initiated.

The interesting results of several experimental projects devoted to the regeneration of Canadian forests featured research activities of the Dominion Forest Service. The Service reports that the main pulpwood species, spruce and balsam fir, are reproducing satisfactorily on cut-over lands throughout Eastern Canada. The regeneration of jackpine on burned-over lands is satisfactory provided that a seed supply is available.

A considerable interest in the growth of yellow birch and maple resulted from an experiment in western Quebec in which defective trees and underbrush were removed from a stand of northern hardwoods. A red pine plantation near Rockland in eastern Ontario showed continued benefits in growth rates because of thinnings made some years previously. In Alberta, experimental treatment of the forest floor to obtain reproduction of a desirable species in an understocked mixed wood stand shows considerable promise.

Research into mechanical methods of separating wood from bark in mill waste may prove to be of economic value to pulp and paper mill operators. Experiments by the Forest Service indicated this might be accomplished commercially by electrolysis.

The Service continued research into possible methods of cutting down Canada's annual fire losses by obtaining valuable data on moisture and inflammability in relation to weather conditions and for the completion of fire danger tables specifically adapted to the regions.

The conservation of large and valuable supplies of timber should result following the success of work on the use of red-stained jackpine in ties and poles.

Increased use was made by the provincial forests services of the results of air photography of Canadian forests. Detailed forest maps and timber estimates supported by field work were prepared as well as general forest inventory maps and a sample photolithographic map. Advances were made in the development of instruments for the plotting of timber type lines.

The Forest Products Laboratory in Vancouver conducted research into production methods intended to reduce the wastage of raw materials, to increase the efficiency of utilization, and to increase the use of species of minor importance. Compilation of test data on six logging operations in coastal areas showed that, if relogging had not been practised, about 50 per cent of the original volume would have been left as waste.

The Laboratory acquired much valuable information on the application of chemical research to waste utilization of Western Canadian woods.

Working in co-operation with the Forest Service, the Pulp and Paper Research Institute of Canada conducted research on lignin in an effort to improve pulping technique and to effect economic large-scale uses for what, at present, constitutes one of the largest waste-disposal problems in Canada. Institute observations on a system of logging steep slopes by gravity cableways confirmed previous conclusions that its introduction into Canada is desirable for conservation and economy.

Activities of the Surveys and Mapping Bureau were geared to meet the greatly increased demand for maps used primarily in the study and development of Canada's natural resources. To meet this demand and to ensure greater efficiency and higher standards of accuracy, the Bureau increased its personnel, improved existing facilities and techniques, and installed additional equipment.

Vertical air photographs covering 340,000 square miles were received in the Air Photographic Library.

In all the topographical work full use is made of modern equipment and scientific tools. For instance, the Bureau is experimenting with the use of the helicopter in mountainous areas for the movement from station to station of field parties and their equipment.

Hydrographic charting facilities were expanded to meet increased charting demands in the Canadian Arctic regions, the Mackenzie River-Great Slave Lake area, and in the coastal waters of Newfoundland and Labrador. The new hydrographic ship "Cartier", fitted with modern scientific navigation instruments, was launched for work on the Atlantic seaboard.

Pacific navigation will experience an effective saving of time and mileage as a result of a current survey conducted at Active Pass.

The Bureau commenced work on the production of a new series of World Aeronautical Charts drawn to specifications laid down by the International Civil Aviation Organization, to cover all of Canada. Its geodetic work was concentrated on extending control into Canada's northland in line with the expanded program of northern development. A year's testing of the method known as Shoran indicates the establishment of control much more rapidly than by the present method of visual fixation.

Much valuable assistance was rendered to Canadian industry and to governmental agencies through the astronomical and geophysical research activities of the Dominion Observatories. Navigation is benefiting materially from the magnetic studies being carried out in the Arctic and Hudson Bay areas. Activities centring about the seismic studies of the earth's crust, the continuous construction and modification of the magnetic map of Canada, and the gravity survey are of interest to geological and mining companies. Considerable success was reported from the summer and winter installations set up in connection with the seismic survey of Canadian Shield areas in northern Ontario and Quebec.

Important advances were made in astrophysical research programs, notably in the study of the spectra of cool red giant stars. Continued study of meteors in co-operation with the National Research Council led to a very accurate determination of meteor orbits and the part of the earth's atmosphere in which meteor phenomena take place. Further meteor study was initiated to assist in solving important problems confronting the Department of National Defence in connection with flight of long-range projectiles.

The Water and Power Bureau directed special attention to urgently required investigations, particularly the Columbia River survey, floods in British Columbia and on the prairies, problems involving prairie rivers, and the Snare River Power project in the Northwest Territories.

Three field parties made reconnaissance surveys of possible storage reservoirs on the upper tributaries of the Columbia and Kootenay Rivers.

In the extreme flood conditions on the Fraser and Columbia Rivers in May and June, a particularly valuable service was rendered by the Vancouver office which became the centre of all information with respect to river levels throughout the province.

Increased interest in the varied services and activities of the National Museum of Canada was shown by educational institutions and the public. This was especially evident in the increased attendance of adults and children at Museum activities and in the growing demand for Museum publications and visual aids. The expanded program of field work by the Museum in 1948 was reflected in the improved and extended facilities offered.

A search for archaeological sites on the old migration routes from Asia into America was conducted in British Columbia and the Yukon.

Co-operative field investigations led to the discovery of a number of interesting Eskimo stone ruins in Ungava and a series of semi-subterranean houses built of stones, whale bones, and turf on Baffin Island.

Main development from the viewpoint of Museum exhibits was completion of the beaver habitat group, work on which had been in progress for several years.

Field work on the birds and mammals of western Saskatchewan provided data on their distribution, classification, and economic status that is fundamental to an intelligent wildlife conservation program. Much of this work was centred in the ecologically varied Cypress Hills region.

Since its establishment in June, 1947, the attention of the Geographical Bureau has been focused on the compilation of data on Northern Canada.

The Bureau's field parties penetrated into the Canadian Arctic Islands, the western Arctic, the Thelon River area and into northern Quebec.

The Bureau is building up a well-catalogued series of maps of Canada and foreign countries that will be adequate for the needs of all Federal Government departments. It has been assembling information for preliminary planning of an Atlas of Canada, for which Cabinet approval has been given.

More detailed accounts of the activities of the various units of the Branch follow.

Bureau of Mines

Aiding industry in attaining maximum efficiency and economy in the processing of Canadian ores and minerals and in utilization of the products of the mines continued to be a main objective of the Bureau. Bureau engineers seem to be nearing a solution of the baffling problems concerned with the efficient treatment of refractory gold ores occurring in the Northwest Territories and in the Red Lake area, Ontario. In another project they have worked out corrective procedures that will curtail substantially losses in mill tailings being experienced by several Canadian gold producers.

Meantime the Bureau actively sought methods of utilizing marginal and sub-marginal deposits of industrial minerals, an important goal being to lessen the adverse effects of possible disruption of outside sources of supply. In this work the Bureau can report encouraging headway toward making silica products of the highest purity from deposits of relatively impure silica not hitherto utilized. The work is of special interest to the glass and sodium silicate industries, which now import most of their requirements of high quality silica sand.

An investigation was undertaken of the possible uses of clays for other than ceramic purposes. Here the Bureau has in mind the possible use of domestic clays as plasticizing agents, chemical reagents, and light weight aggregates.

Continuation of the work on rock wool resulted in improvement of the quality of the material being produced in Canada.

In co-operation with the International Joint Commission and the United States Geological Survey, the Bureau undertook a special survey of the waters of the Columbia River basin in British Columbia.

It commenced an intensive study of mineral raw materials for fertilizer use in Canada and of processes for utilization of domestic resources.

In the field of physical metallurgy much was accomplished toward the experimental development of new alloys that will meet exceptional service conditions. One such alloy, developed in co-operation with the National Research Council, is now under test in jet engines. Research on new magnesium alloys and improved fabrication methods gave excellent results in the development of a high strength magnesium casting alloy. Its very favourable strength-to-weight ratio is an important consideration for aircraft and airborne equipment.

In a study of the welding of structural steels under winter conditions the Bureau obtained results that remove any doubt as to the practicability of such welding. Further success in this work will mean the saving of much time and money in Canadian building construction.

A thorough study of the multitude of steel specifications indicated that the number of these specifications can be reduced materially and thus help toward a more efficient production of steel and steel products.

A program aimed toward finding suitable substitutes for such strategic alloying metals as chromium and manganese was initiated. A shortage of ores of suitable grade of both these metals exists on the American continent. Particular attention was given to the use of magnesium as a desulphurizing agent in steel production.

Following encouraging results from laboratory scale work the Bureau set up a pilot plant to separate bitumen from the bituminous sand of northern Alberta and to try out a new process for treating the recovered bitumen. The plant was about ready for operation by the end of the fiscal year. Bureau engineers believe that this process will give a product that can be transmitted by pipe-line and can be handled without difficulty in oil refineries.

To assist the coal industry in lowering costs, increasing production, and conserving the coal resources of the country the Bureau has been making exhaustive studies of coal mining methods and underground gasification of coal in Canada and abroad. To this end Bureau engineers visited most of the operating coal fields in Canada and a number in the United States.

As a follow-up to its work during the previous fiscal year the Bureau extended its surveys of the natural gas resources of Western Canada into new producing fields in co-operation with the Geological Survey.

The discovery of new mineral areas such as those in the Northwest Territories, and the increased activity in mineral development has enhanced the value of the Bureau's mineral inventory as a concise source of information on the exploration and development now in progress. Steps were taken to incorporate the mineral occurrences in Newfoundland in the inventory.

Problems arising from applications for assistance under the Emergency Gold Mining Assistance Act received much attention. This involved field inspections of most of the gold mines applying for assistance.

In the administration of the Explosives Act, the number of explosives accidents involving children continued to be a source of concern. Carelessness on the part of users of explosives in storing detonators was again the primary cause of such accidents. Warning posters and circular letters were sent to all contractors operating licensed magazines. Many types of fireworks of British origin were declared authorized by the Bureau for importation. In furtherance of its investigation of the hazards attending the storage and shipment of ammonium nitrate fertilizer, an officer of the Bureau observed five large-scale tests by United States agencies.

The staff of scientists working on radioactive ores handled a heavy volume of test work, resulting largely from the marked increase in prospecting. Most of the ore dressing research concerned the ores and products from the Crown-owned Eldorado Mining and Refining (1944) Limited, but methods of extraction were also determined for ore from private companies. Research led to the development of a process for the treatment of low grade uranium ores. A method developed by the Bureau to improve the speed and accuracy of measurements of radioactivity is being used at the Port Radium plant of the Eldorado company with results closely equivalent to the most careful chemical analysis. Methods were also developed for the determination of thorium in ores, and a simplified method was devised for the analysis of ore by a standard Geiger field counter.

The unit responsible for producing secret naval equipment moved into new quarters. All equipment was installed and the unit is now fully operative on the repair and assembly of anti-submarine equipment. A laboratory was set up for re-grinding radio frequency crystals for the three Armed Services.

Special Mineral Projects

Agreement with Yukon Coal Company, Limited

This agreement was entered into by the Department July 10, 1947, to advance to Yukon Coal Company Limited a Government loan not in excess of $300,000 to develop and operate the Tantalus Butte coal mine near Carmacks, Yukon, necessity for which arose as a result of increased mining activities in Yukon and increasing cost of diminishing supplies of wood, particularly in the Mayo and Dawson areas. The loan is repayable by a royalty on production. Administration of the agreement was assigned to the Bureau of Mines and at the close of the fiscal year advances amounted to $204,124.60. Repayments from the sale of coal totalled $3,496.50, and $7,912.74 re-expendable revenue from the sale of equipment was also remitted to the Government.

The mine was in operation throughout the 1948 navigation season and much development work was done to prove the continuity of the main coal seam at depth and to prepare the mine for substantial production as markets developed. The latter work was curtailed near the close of the season when it was seen that potential markets for the coal could not be immediately realized, largely owing to lack of transportation facilities. Much attention was being given to the problems of marketing the coal. Completion of a proposed all-weather main Yukon highway passing through Carmacks may help to widen the

markets for the coal. Meantime, operations have been restricted to mining sufficient coal from the old upper workings to meet existing markets within the limits imposed by the present transportation facilities on the Yukon River system.

Agreement with Abasand Oils, Limited

Because of the urgent need for petroleum during the war, funds from the War Appropriation were used to remodel and enlarge the bituminous sand plant of Abasand Oils Limited near Fort McMurray, Alberta, and to operate it as a test plant for the extraction and refining of bitumen from the tar sands of the McMurray area. The separation plant was destroyed by fire in June, 1945, and under an agreement of sale dated November 1, 1946, the remaining facilities were handed over to the Company, which expected to rebuild the plant and proceed with development of the bituminous sands as a major source of petroleum products. However, large quantities of well petroleum became available from Alberta fields and this development became impracticable for the present. The Company, with the consent of the Department, decided to salvage the plant and other facilities, and the proceeds from sales were forwarded to the Federal Government under the terms of the agreement. Most of the plant and equipment had been sold by the close of the past fiscal year. The company is retaining its lease of an extensive area underlain by high-grade bituminous sand 20 miles north of Fort McMurray.

Exploration of Deposits of Bituminous Sands

The Branch made preparations to publish the results of its extensive wartime drilling in the bituminous sands area north of Fort McMurray, Alberta. It issued a series of plans and sections for limited distribution.

Agreement with Fluoroc Mines Limited

During the war the Government entered into a number of loan agreements with mine operators to stimulate production of fluorspar in the Madoc area, Ontario. All but one of the loans were repaid with interest from sales of fluorspar produced, the only loan outstanding being that of Fluoroc Mines, Limited, successor to Trent Mining Syndicate, Limited, amounting to approximately $10,000. The company's property is in Huntington township, Hastings county. It was not operated in 1948 but further development is planned.

Former Wartime Oils, Limited

On April 1, 1948, the Department of Reconstruction and Supply turned over to the Branch administration of the former Wartime Oils, Limited, project. During the war the Government advanced funds through this Crown company to drill 22 wells in the Turner Valley area, Alberta, 21 of which became producers. Under the terms of agreement with owners of the wells the funds advanced are repayable out of production. At the end of the past fiscal year six of the producing wells had repaid the cost of drilling, and the rest of the producers had repaid a large part of their outstanding advances, the balance unpaid being $783,495.97. Revenue from the six paid-up wells continues in the form of a royalty on production in varying amounts proportionate to the amounts advanced for drilling each well.

Roads Into Mining Areas

A proposal from the Government of Manitoba for Federal assistance in building part of the Flin Flon Highway crossing mineralized territory was prepared for consideration by the Cabinet. Administration of the resulting agreement rests with the Lands and Development Services Branch. A request from the Government of British Columbia for Federal aid in construction of roads into two mining areas was received near the end of the fiscal year, and the proposed projects were examined with a view to their reference to the Cabinet.

Mineral Resources Division

The Division provides a comprehensive information service on mineral resources and their economic development and use. It makes investigations and studies of a technical and economic nature on matters which relate to the economic development of Canada's mineral resources.

One of its basic functions is therefore the assembling, correlating, tabulating, recording, and indexing of new mineral and related data as they become available from numerous sources. This is added to the large mineral information pool accumulated over many years. A highly essential part of this information pool is the mineral resources inventory of Canada. This includes an index of mineral occurrences, the need for which as a base for appraising the mineral productive potential of a country was so strongly emphasized by the experience of World War II, not only in the wide range of minerals but in the tremendous quantities required to support a highly developed industrial economy.

Discoveries in new mineral areas such as the Northwest Territories, and the increased activity in mineral development in all parts of Canada has enhanced the value of the mineral inventory as a concise source of information on the exploration and development now in progress. In line with the policy of assisting the mining industry a condensed review of a number of lead occurrences was issued as a Bureau of Mines Memorandum Series, entitled, "Notes on Lead Occurrences in Canada".

At the request of Canadian Arsenals, Limited, an outline of Canadian mineral supply was prepared covering 53 metals and minerals.

A statement, "Facilities Existing for a Survey of the Mineral Resources and Reserves of Canada", was prepared for the British Commonwealth Specialist Conference on Mineral Resources held in London in September, 1948.

The Chief of the Division acted as technical adviser to the Canadian representation on the Combined Tin Committee, which allocates the world's supply of tin, and attended meetings of the Committee in Washington when Canada's allocations of this essential industrial metal for the year were determined. He also attended the conference on tin held at The Hague in October, and, as representative of the Department, attended a mineral resources conference in London.

Several officers served upon various inter-departmental committees formed to consider and advise upon national and international problems to which minerals and mineral problems were related.

Industrial Minerals Section

The Section specializes in the occurrence, processing, and utilization of non-metallic minerals, sands, clays, and rocks, and on ores of such alloying metals as cobalt, manganese, molybdenum, and chromium.

Resulting from the steadily increasing requirements of the chemical, construction, general manufacturing, and agricultural industries for industrial minerals, Canada's production of these minerals has set new records each year since 1944. However, large quantities of the industrial minerals and their products are also imported and these imports now exceed in value that of the domestic production of a few years ago.

An important step toward lessening Canadian dependence upon outside sources of mineral raw materials was the development of a process to recover silica of a high degree of purity from sandstones hitherto considered too impure to yield products for making glass, sodium silicate, and other silica products. The process was developed in co-operation with a company manufacturing milling machinery.

Encouraging progress was also made in the beneficiation of relatively impure gypsum.

Preliminary work was completed on an investigation into the chemical and physical characteristics of Canadian clay and shales, the aim being to produce light-weight aggregate from them and to prepare products suitable for chemical raw materials and plasticizing agents.

At the request of the International Joint Commission, a special survey was undertaken of the chemical characteristics of the waters of the Columbia River basin in British Columbia. A similar investigation is being made by the United States Geological Survey of the waters in the United States portion of this watershed. The results will be incorporated in the main survey of the industrial waters of Canada now in progress. The collecting of water samples in southern and western Ontario was continued and data on the work done to date in Eastern Canada were assembled and classified for a report.

Continuing its special studies on the greater use of Canadian limestone, brucite, magnesite, phosphate, potash, and sulphur-bearing minerals for agricultural purposes, the Section collected information on processes that seem to offer good prospects for the utilization of domestic resources.

Work was continued on making magnesium oxychloride and magnesium oxysulphate cements from domestic sources of magnesia, and investigations were made into the processes and economics of producing special grades of magnesia and magnesia compounds from waste products of the brucite-magnesia industry.

A special survey of sources of road materials in Prince Edward Island was undertaken at the request of the Government of that province and a report was issued.

Work on rock wool was continued with emphasis on the utilization of new raw materials and on means of further improving the quality of the wools being made from standard raw materials.

Extensive laboratory tests were made on shipments of basic slag and of barite from Nova Scotia.

Economic Section

This Section is concerned with all matters of an economic nature pertaining to the development, use, and conservation of Canada's mineral resources, and more particularly of metallic mineral resources. Its mineral investigation and information service is used freely by mining and related industries, by Government departments, and others interested in the economic aspects of Canada's mineral development.

The depressed condition of the gold mining industry continued to receive much attention. The Emergency Gold Mining Assistance Act authorizing payment of "cost-aid" assistance to gold mine operators was brought into force on June 15, 1948. Basic material had been prepared in the Section in connection with the drafting of the regulations under the Act. The section has since assisted the Branch Director in co-operation with the Cost Inspection and Audit Division of the Office of the Comptroller of the Treasury in the administration of the Act for the Minister. Much time was therefore given to consideration of applications from gold mine operators for assistance payments. By the end of the fiscal year Bureau engineers had made the field inspection of most of the gold mines that was required before final consideration of applications in respect of gold produced from these mines and sold in the designated year 1948.

Studies were made of the economic development potentialities of the mineral resources of the Mayo area, Yukon, as a long-term market for proposed power developments in the area; of possible markets for Labrador iron ore; and of the possibilities of basing a small primary iron and steel plant in Alberta on iron ores from British Columbia and on iron oxide residues from the Trail smelter.

Reviews for 1947 on about 70 Canadian minerals were prepared for public distribution, and similar reviews for 1948 were being prepared.

Comments and opinions were prepared on behalf of the Department on referrals to it from the Department of National Revenue on matters pertaining to the administration of special tax concessions granted under Dominion tax legislation to mine operators. Twenty-five applications from corporations operating new mines for the three-year exemption from income tax provided for such mines were referred to the Section for consideration. Submissions were prepared in co-operation with the Chief Geologist for the Minister's information in considering 11 applications from oil companies for the 50 per cent tax deduction incentive for drilling approved deep test oil wells, provided under Section 16(5) Chapter 63, 11 George VI, an Act to amend the Income War Tax Act.

In co-operation with the Department of National Revenue a revision of the "Summary Review of Dominion Tax and Other Legislation Affecting Canadian Enterprises" was made as at the end of 1948, and was made available for distribution in mimeographed form.

Mineral Dressing and Metallurgy Division

Technological assistance rendered by the Division to the mineral, ceramic, and metal fabricating industries helped these industries to keep pace with the swelling flood of demand for their products. To various mining companies with properties nearing production, guidance was given in the design of their mill flow sheets. For other companies in steady production, difficult mineral dressing problems were worked out, enabling in some cases higher recoveries and in others more efficient over-all operation of ore concentrating plants. For the Governments of British Columbia and Alberta a large number of clay samples were tested and evaluated in connection with surveys the two provinces are making of their clay resources.

Research work in all the main fields of endeavour of the Division was further expanded. Research on refractory gold ores occurring in the Northwest Territories and in the Red Lake area, Ontario, was successful in solving several of the problems that had formerly baffled the operators. An investigation of the possible economic use of tungsten carbide balls as a medium for fine grinding gave initial results indicating a large increase in grinding capacity over the use of steel balls. High temperature phase equilibrium studies in ceramics that were undertaken in the previous fiscal year will provide manufacturers of clay products with valuable detailed information concerning chemical reactions involved in the firing of basic refractory material and ceramic whiteware compositions. Investigations in co-operation with the Defence Research Board dealing with the properties and limitations of metals under Arctic and sub-Arctic conditions give promise of reducing costly delays caused by weather conditions in these northern regions.

More detailed accounts of the activities of the three Sections of the Division follow.

Mineral Dressing and Process Metallurgy Section

Forty samples of ore ranging from 100 pounds to several tons were received from companies developing new properties or desiring to improve their operations and recovery. The samples comprised twenty gold ores, five of which were tailing loss problems, two silver ores, six zinc-lead ores, two copper ores, and ten industrial minerals. Complete reports were issued to the companies concerned, giving pertinent information as to design of flowsheets, suitability of products for present or new uses, or corrective procedure for improving present practice.

Twenty-two companies used the laboratories to carry out investigations on their own ores or processes.

In the aforementioned research on refractory gold ores techniques were worked out for controlling or counteracting the effect of the interfering minerals and the excessive consumption of chemical reagents, and for increasing the recovery of gold from their ores.

Gold losses being experienced by producers of the metal in their mill tailings were investigated, using special facilities not ordinarily available in milling plants. Corrective procedures were devised which should result in a substantial reduction in the losses.

An investigation concerning the sintering properties of Steep Rock iron ore resulted in a strong and suitable sinter being produced. The project was undertaken at the request of a Canadian smelter desirous of using the Seine River type ore which contains a large proportion of fine ore. Concurrently, some of the principles of sintering iron ores were investigated and valuable data were obtained on converting high sulphur iron ores, now unsaleable, into useful metallurgical products.

Investigation was continued on the possibility of developing a process whereby a chromium-bearing product can be produced from the low grade chromite deposits in Manitoba that could be used in the event of an emergency, or perhaps a product that might compete with high grade imported ore.

Work for the Manitoba Government was underway on a carlot shipment of spodumene ore from Manitoba, the aim being to develop suitable processes for the extraction and manufacture of lithium products of commercial interest. A sample of spodumene from Amos, Quebec was submitted for similar investigation.

Research work on the tungsten carbide balls gave preliminary results which indicate that balls of this type with a specific gravity of 7·8 show a large increase in grinding capacity over steel balls of the same specific gravity. The wear factor is difficult to determine on small scale tests but the tungsten carbide ball appears to have a life of approximately 10 years. High cost is the main disadvantage in their use, the indicated advantages being: large increase in grinding capacity, resulting in decreased building, labour, and power costs; high wear resistance, resulting in decreased handling costs, no contamination of material being ground, and less changing of ball in size percentages owing to longer wear. This type of grinding media thus seems to warrant further investigation.

The Bureau accepted a proposal of Aerofall Mills Limited of installing an experimental unit in the laboratories for research and demonstration concerning crushing and grinding problems of mill operation. This mill is a dry grinding type having a special air separator feature which differentiates it from ordinary practice. The company's engineer conducted tests on two samples of gold ores, three samples of asbestos, three samples of sandstone, and on one sample each of calcite, gypsum, and slag quartzite. Some of the results were quite encouraging, and certain companies concerned with such ores are considering the application of this mill in practical operation.

The special claims made for this mill by the company are: (*a*) the grind can be controlled within close limits, (*b*) a minimum of slimes is produced, (*c*) the unit tends to grind to the natural grain size of the mineral constituents, (*d*) deleterious materials such as talc and certain oxides of a friable or soft nature tend to form extreme fines which are readily removed by the air separator feature.

These features if substantiated, would result in lower milling costs, increased recoveries, and would possibly make certain sub-marginal ore deposits economical of operation.

Ceramic Section

This Section serves as a centre for both applied and fundamental research for the industries of Canada concerned with the production and use of raw and manufactured ceramic materials. A main aim of this research is to aid industry in making the best use of the available domestic raw ceramic materials, which in several cases are marginal or sub-marginal in quality. The testing and evaluating of Canadian raw materials as to their suitability for possible ceramic uses comprise a major part of the work, as does the technical guidance and assistance given to industry in overcoming production and other problems.

A total of 240 clay samples from the various provinces were tested and evaluated, 120 of which were from Alberta, and 60 from British Columbia. The large number from these two provinces resulted from a co-operative effort with the provincial governments in connection with their field surveys of clay resources.

Numerous commercial samples of heavy clay products such as brick and tile were examined and evaluated as to quality. Of special interest was the testing of a number of samples of brick from various manufacturers for freezing and thawing characteristics, an important consideration under Canadian climatic conditions.

Testing and evaluating refractories for use in marine boilers in the Naval Service received much attention. Section officers, serving on the Dominion Purchasing Standards Committee on Refractories, assisted in drafting standard specifications for refractories for marine boiler service.

Visits to the ceramic plants in southern Ontario and Quebec led to the investigation of various problems encountered during the course of the survey. One such problem which was successfully worked out concerned the development of improved plasticity in a shale. In another, still under investigation, a method is being devised for accelerating the ageing of a ceramic mixture to avoid storage in a moist condition prior to pressing.

For a manufacturer in the Maritimes, suitable blends of clay and shale were worked out and the firing characters were determined. For another in Ontario, work was started on the development of a suitable glaze for a low thermal coefficient of expansion body for use in electrical stove plates. Electronic porcelains for special uses were being developed for the Department of National Defence. Improvement in metallurgical practice is expected to result from the development, in co-operation with a manufacturer in Quebec, of refractories with a suitable permeability to gas and with other essential properties for introducing gas into ladles of molten metal in the process of flushing to remove impurities.

High temperature phase equilibrium studies in ceramics were continued. The choice of the two investigations under way in this branch of chemical science was governed by their possible adaptation to specific Canadian ceramic materials and problems. In studies of this kind the methods used deal with the underlying reactions that take place when common earth-forming oxides react together at high temperatures. It is thus possible to obtain some insight into the complex reactions that occur in the firing of a ceramic body.

One system that is being investigated, and on which the work is nearing completion, involves four common oxides, lime, magnesia, alumina, and silica. Compositions are being studied within this system in an effort to determine the effect of alumina on high lime magnesite clinker of the type produced in Canada. Forty-four glass compositions were synthesized in this system and 396 quenching experiments were carried out on these compositions. This investigation will give information that will indicate to manufacturers the range of unfavourable alumina contents of refractory clinkers. It will also

indicate the effect of natural spinels, such as aluminous chromite, on refractory clinkers, the amount of coal ash that can be tolerated in firing such clinkers in rotary kiln practice, and other matters of interest to the producer and consumer of such materials.

The other system being investigated concerns the composition of ceramic whitewares where nepheline syenite is combined with clay, flint, and feldspar. Fifty-eight glass compositions were synthesized and 118 quenching studies were made on them. The data obtained will indicate to whiteware manufacturers the reactions that take place in the firing process and the effects that might be anticipated from certain compositions.

A laboratory was established for the investigation of highly refractory oxides such as alumina, thoria, beryllia, and zirconia. Investigations in this laboratory were designed mainly to assist the National Research Council in its Atomic Energy Research project .

Physical Metallurgy Research Laboratories

Requests from industry for the investigation of various metallurgical problems largely shaped the pattern of activities of the Section. Means of overcoming most of them were determined. Meantime, the Section gave increased emphasis, with good results, to the experimental development of new alloys and processes and to the improvement of metallurgical methods. Much of the research was on projects of particular interest to the Armed Services, but in most of these the knowledge gained will be of value to industry as well.

One service to industry was the establishment of the fabrication methods, material specifications, and heat treatments for all the metal parts used in the production of a newly designed road grader and snow plow being used on Canadian highways and which is made in Canada. A reduction of the wear and breakage of metal parts under severe service conditions resulted from this work. Another was the development of production control methods and of the heat treatment cycles for the manufacture of metal spindles used in razor processing machines. This led to the successful production of these parts, which must be of the highest quality, in Canada.

Development of the detailed procedures for welding large machine elements enabled a Canadian plant to produce structures acceptable within fixed close tolerances, and so replace costly castings previously available only in the United States.

An extensive project on the centrifugal casting of light alloys was undertaken jointly with the American Foundrymen's Society. In this, it is intended to study the possibility of the commercial application of this technique and to increase considerably the metal yield of the castings and so improve their soundness and mechanical properties. Initial results on centrifugal aluminum alloy sand castings showed the importance of proper mould geometry and non-turbulent metal flow in rapidly rotating moulds. Other foundry work included investigations on zinc die-casting, billet and slab casting, nickel bronzes, and on some high strength aluminum alloys.

The emphasis given to the development of new alloys arises largely from the need for such alloys to meet exceptional service conditions—alloys that will perform satisfactorily, for instance, at high and sub-zero temperatures. To this end the Bureau provided facilities to gain an understanding of the properties of promising alloys in order to indicate the direction of future alloy developments. An automatic thermal analysis unit was designed, built, and operated successfully. Use of this unit facilitates determination of the phase diagrams of alloy systems and provides further required thermal fundamental data of the highest accuracy.

Jointly with the National Research Council, the development of nickel-aluminum-molybdenum alloys and modifications of these alloys was continued with satisfactory progress. One such alloy is now under test in jet engines. By use of a high temperature fatigue machine as a laboratory jet engine the working conditions in a gas turbine are simulated in the required temperature range and the fatigue properties and dynamic creep of the metals are determined.

Work on a new magnesium alloy, undertaken a few years ago, has resulted in the development of a high strength magnesium alloy containing six per cent zinc and one per cent zirconium. The project is a co-operative effort with the Industrial Advisory Committee on Magnesium Research on which are representatives from the Armed Services, universities, research organizations, and industry.

Investigating the practicability of welding structural steels at temperatures of −30° F. for the Armed Services at Churchill, Manitoba, the Bureau obtained highly satisfactory preliminary results, of interest to industry as well as to the Services. Because of doubts that have been associated with structural steel welding in Canada under winter conditions, steel building contractors have followed the more costly and time-consuming practice of rivetting such structures. The aforementioned results have removed the cause for such doubts. At the same time research was initiated on determining and evaluating the mechanical behaviour of steels at sub-zero temperatures.

A problem encountered by the Armed Services in reference to the storage of canned food supplies led to an investigation of a phenomenon known as "tin plague" by which tinning disappears off tinned goods under Arctic conditions, often necessitating destroying the goods. Aimed toward enabling the Bureau to recommend a tin alloy coating material that will not develop tin plague, the work to date has provided valuable information on the particular circumstances under which the condition occurs. Progress was made in research on alloying metals such as zinc, copper, and aluminum that must be added to tin to prevent the formation of grey tin.

Primarily for use of the Armed Services but of special interest to industry also are the attempts of the Section to rationalize the large number of steel specifications. Work to date already indicates that the number of specifications can be greatly reduced and that it may be possible to establish a relatively few standard specifications for the industry, making for greater efficiency in steel production.

A method of evaluating the service life of drill rods used in Canadian mines resulted from studies of the effect of low temperature stress relief and water corrosion on the fatigue properties of shot peened S.A.E. 1080 steel. A new endurance test, simulating on a laboratory scale the working conditions of mine drill rods, was also devised. Use of the results of this experimental work should enable a reduction in mine operation costs arising from drill steel breakage.

A new magnetic method for measuring internal micro-stresses in steels devised by the Section will provide design engineers with a means of analyses of the progress of elastic and plastic deformation of metals.

The problem of the production of sound and clean steel castings continued to receive major attention. Further investigation of the factors that influence the production of good castings provided evidence of the influence of ferrostatic pressure on metal penetration of core sands. It is difficult and costly to clean castings possessing the after effects of metal penetration, thus the research is of considerable importance to the steel casting industry.

The Section continued its fundamental studies of the relationships between stress and strain in elastic and plastic states in metals. This work included investigation of the dynamic notch sensitivity of typical ferrous and non-ferrous

metals used in Canadian industry. This is expected to provide basic information for the design engineer and includes a study of the effect of micro-structure, hardness, and cumulative damage at varying stress amplitudes.

Growing concern over the shortage on the American continent of manganese and chromium ores of suitable grade for alloy steel production prompted the Section to undertake a research program on possible substitutes. The initial results gave good indications of ultimate success in the work. A 250 K.V.A. electric furnace is to be installed for use in connection with this research.

Further substantial progress was made in research in the Bureau's metal forming laboratory on the extrusion of magnesium, aluminum, and copper alloy shapes and tubes, and on the hot and cold rolling of light alloy sheet. Work in this laboratory on the extrusion of magnesium has enabled a Canadian firm to set up and operate its own extrusion plant.

Significant advance was made in investigations of the corrosion of metals. In one project, undertaken for the Armed Services, specifications were worked out for anti-freeze materials. In another, a power line cable was developed which will resist the corrosive attack of marine atmosphere. Various corrosion problems which arise in connection with Armed Services equipment were also handled.

The increasing use of radioactive isotopes for tracer studies in metallurgy fuels and ore dressing caused the Bureau to arrange for the provision of a radioactive tracer laboratory. Essentially, the laboratory will provide the Bureau with the latest experimental means available in the study of steel and other metal structures. Work in the laboratory will be largely of a pioneering nature in which investigations will be made into the application of radioactive tracer materials to industrial and scientific problems.

A large number of fundamental metallurgical investigations were undertaken for the Atomic Energy Project at Chalk River, Ontario.

Fuels Division

The Division directed its work toward improving the over-all fuel economy of the country by promoting, through research, the wider and more efficient use of Canadian fuels. Problems of fuel supply in relation to demand continued to cause difficulty owing to the widely separated location of Canadian coal fields and to the high cost of transportation. The use of oil fuel for heating homes and small industrial requirements continued to increase. A mild winter in Ontario and Quebec permitted the increase of oil-burning installations without placing undue strain on manufacturing and distributing facilities.

Close contact was maintained with the exploration of oil shale deposits in New Brunswick. The new gas and oil fields in Western Canada were visited and samples obtained. In collaboration with the Departments of Agriculture of the Dominion and of the Province of Quebec, humified peat was supplied to a number of apple orchards in an effort to increase the fruit yield by improving the water-retaining capacity of the soil and by adding organic matter to it. Peat deposits in Prince Edward Island, in northern New Brunswick, and in Quebec, were examined and samples were obtained for investigation.

Coal Mining Operations in Canada

A definite trend toward more efficient coal mining methods was observed. This is important in lowering costs, in obtaining increased production, and in conserving the coal resources of the country. As a step toward assisting industry in reaching these objectives, visits of inspection were made to practically all the operating coal fields in Canada and a number in the United States to study mining methods, mechanization and underground gasification of coal.

Efforts to have the Tantalus Butte coal mine at Carmacks in Yukon developed were continued. The burning properties of samples of coal from this mine were studied. The marketing and transportation problems involved in putting the mine into commercial operation were investigated. Combustion tests were observed of an industrial steam boiler unit, mechanically fed with a stoker of the spreader type, and a test was also observed on a river steamer in Yukon. It seemed evident that Tantalus Butte coal could be handled satisfactorily by mechanical stokers, and Yukon and White Pass Route has made preparations to use the coal in one of the steamers on the route from Whitehore to Dawson City, during the 1949 shipping season. Samples of the coal were briquetted and acceptable briquettes for domestic and railway use were obtained.

Bitumen and Crude Oils

Following the encouraging results of small scale experiments, a pilot plant was set up to separate bitumen from bituminous sand, using water at a temperature of about 70° F., and to try out a new process for treating the recovered bitumen. It is believed that this process will permit the complete removal from the bitumen of sand and water carried over with it by processes formerly used and will produce a product that can be transmitted by pipe-line and can be handled without difficulty in oil refineries. A large quantity of bituminous sand from northern Alberta was obtained, the necessary processing equipment was designed and set up, and by the end of the fiscal year the plant was practically ready to start. The Division kept step with the new oil development in the West by obtaining samples of the crude oil produced and fractionating them in a true-boiling point still to indicate the relative yield of commercial products.

Natural Gas

In collaboration with the Geological Survey, a study of natural gas resources in Western Canada was made. This survey is being extended as new fields and additional data become available. Most of the 30 samples of natural gas collected, mainly from Alberta, were analyzed to show hydrocarbons, helium, and other gases. In this analytical work the Division is ever on guard for the presence of helium in commercial quantities.

Properties and Beneficiation of Canadian Coals

The Division continued its program of planned research designed to obtain as much basic information as possible from the examination of samples of coal from each coal seam being operated in Canada. Physical and chemical properties were determined and physico-chemical characteristics were studied. As the work progressed, additional properties of the coals were investigated such as crushing, dust-producing characteristics, separation of the petrographic constituents, and examination of the resulting "bright" and "dull" coal.

The investigations afforded data on the extent to which a coal can be beneficiated and improved for different uses, data on mining efficiency, sizing and cleaning operations, and data permitting a comparison of intrinsic characteristics of any particular coal with others in the same or in different mining districts.

Studies were made of samples from the Phalen seam in Nova Scotia as it occurs in the No. 1B, No. 2, No. 4, and No. 18 mines, and from the Harbour seam in Nova Scotia as it occurs in the No. 20 mine. Samples from Hasler Creek, British Columbia, and from the strip and the deep mine at Adanac, B.C., were also studied. Reports on these studies were issued or were in preparation.

The beneficiation and improvement of coal for various purposes includes sizing, cleaning, washing, dust-proofing, briquetting, and special treatment to reduce degradation on shipment, on handling, or on storage.

A number of processes have been developed recently for lowering the ash content of coal by using suspensions of mineral matter in water as a heavy medium for separating by gravity the heavier material that forms ash from the coal. As an illustration of the work of the Division in this direction, arrangements were made to have coal from the Galt and Cadillac mines of Lethbridge Collieries, Limited, tested in a pilot plant of the American Cyanamid Company at Stamford, Conn., using the principle of heavy-media separation. The results were satisfactory. The ash content of the washed coal was lowered considerably and the stability to handling was only slightly decreased by the wetting and subsequent drying. The Division assisted in the tests and prepared a comprehensive report on the results obtained.

Considerable time was devoted to the encouragement of coal briquetting in Canada. Briquetting plants in Alberta were visited, conferences with coal mine executives were held, makers of briquetting machinery were interviewed, and arrangements were made for practical tests on different coals. Coals from Kleenbirn Collieries, Sterling Collieries, Lethbridge Collieries, and from Drumheller, Luscar, and Tantalus Butte were tested. A series of briquettes was also made from sub-bituminous coals that had been partly carbonized and the physical properties of the resultant residues were determined.

Combustion Engineering Investigations

The ultimate test for any coal is how it burns, what conditions are most advantageous, and what equipment is most satisfactory. The Division has carried out a series of investigations in the combustion field to obtain reliable information on fuel performance and on the more economic use of coal for domestic heating purposes in existing types of equipment. Five tests were made on Acadia and Bras d'Or coals and three on Midland and Atlas coals (western sub-bituminous) in the B.C.R.-2C smokeless heater and a report was prepared. Burning tests were also carried out on several samples of coal in other types of space heaters, all of which was intended to encourage the use of Canadian bituminous coal in those areas in which this type of coal was available.

Small under-feed mechanical stokers for house heating are being sold in increasing numbers in Ontario and Quebec and are attractive to many home owners because of the small amount of attention needed and the even heat which can be obtained. Relatively smaller sizes of coal are burned and a well-prepared coal of uniform quality is a major factor in the satisfactory operation of the installations. In collaboration with the Stoker Institute of Canada and Bituminous Coal Research, Incorporated, the Division has had an investigation underway for some years with the object of developing laboratory methods for evaluating the suitability of coal for small stoker operation. This work should result in materially improving the domestic fuel position. Arrangements were made to obtain newly designed and improved equipment for use in the work, and also for field tests on Kananaskis coal from Alberta in a number of automatic equipment units that are marketed in Ontario.

To assist in developing a coal-fired gas-turbine locomotive, the Division continued the study of pulverized coal under pressure. A locomotive of this type would require only one-third to one-quarter the amount of fuel required for an ordinary coal-fired locomotive; it would require no water; and it would develop more power in cold weather than in hot weather. Such a locomotive would be especially valuable to Canadian railway companies. The work is being done in co-operation with the Locomotive Development Committee of

Bituminous Coal Research, Inc., Battelle Memorial Institute, Institute of Gas Technology, American Locomotive Company, Johns Hopkins University, and Northrop-Hendy Company. Each organization is developing some particular part of the locomotive or solving some specific problem. The Fuels Division is studying the combustion of pulverized coal from Pittsburgh No. 8 seam, which the collaborating laboratories have agreed to use as the standard fuel. A new combustion chamber was designed for use at atmospheric pressures and construction was begun. A study was made of the theory of combustion of pulverized coal and some preliminary work was done to show the effect of ultrasonic waves on combustion. The results showed no definite increase in rate of combustion of the coal.

Synthetic Liquid Fuels

Although Canada must still import a large percentage of its crude oil, large deposits of coal and other materials are available which can be converted into liquid products if the necessary manufacturing processes can be developed to the point of being economically profitable. The Division has already studied and experimented with the hydrogenation of Canadian coal and Alberta bitumen. It has also kept in close touch with similar work that has been done in other countries, particularly Germany, Great Britain, and the United States. It is the belief of the Division that larger yields of valuable products can be obtained by hydrogenation at higher pressures than have been previously used on this Continent. Drawings for new high pressure equipment for laboratory scale experimental work at a pressure of 20,000 pounds per square inch were prepared and negotiations were entered upon with manufacturers with the collaboration of a firm of consulting engineers. A test cylinder, pump, temperature controller, and valves were ordered. The pump and valves were received and were found to be satisfactory.

Analyses Surveys and Laboratory Investigations

Foundry Coke

Toward improving the quality and uniformity of metallurgical coke used in the manufacture of iron and steel the Division undertook a study of the electrical conductivity of foundry coke as part of a co-operative agreement whereby foundry cokes were to be prepared under carefully controlled conditions during carbonization and then were to be used in cupola operations in collaboration with the U.S. Bureau of Mines and Battelle Institute, Columbus, Ohio. The electrical conductivity of the coke was measured in specially designed apparatus with the thought that the method might be developed for the evaluation of foundry cokes. The small range of variation that was found in the electrical properties of the coke would probably limit application of the method, although the accuracy of the instrument and the reproducibility of data obtained were good.

Asphalt for Briquetting

An investigation was begun of various characteristics of asphalts in relation to their use as a binder for the briquetting of coal and other products, with particular reference to the relative wetting properties of different coals and asphalts.

Plastic and Oxidation Properties of Coal

The swelling and plastic properties of coal are of increasing importance as a practical measure of the suitability of certain coals for definite uses. An investigation was undertaken to develop a simple method of determining the free swelling index of coals for industrial use without necessitating the use of highly specialized equipment and conditions not readily available at coal mines. A special study of the effect of oxidation on the coking properties

of coal from No. 4 mine, Phalen seam, Nova Scotia, was undertaken to explore the possibilities of pretreating this coal to obtain a commercial product with particular coking characteristics. The experimental work was completed and a report will be prepared.

Humic Acid from Coal and Peat

A suitable method was evolved for the separation of humic acid. It will be applied on large quantities of peat to obtain enough of the product for practical tests in the manufacture of briquettes.

Gasoline Survey

Changes in automotive design necessitate that accurate technical data be available regarding the knock-rating, volatility, vapour pressure, and sulphur and gum content of all brands of gasoline sold throughout Canada. These data are also valuable in drawing up and revising gasoline specifications for Government purposes, and as a guide to petroleum refining and hydrogenation investigations. Sixty-one samples of gasoline taken from nine principal distribution centres throughout Canada in the summer of 1948 were analysed and a report of the results prepared.

Explosives Division

No fatalities or injuries involving explosives occurred in high explosives factories, although the quantity of high explosives manufactured was greater than at any time since 1939, the peak year. The explosives industry, regarded at one time as the most dangerous, has become one of the safest. In high explosives factories discipline is recognized as a safeguard by all, and employees themselves contribute materially to the high standards of safety that are almost always maintained.

In the manufacture of detonators and small arms ammunition explosions can scarcely be avoided because of the sensitive nature of some of the explosives handled. Fortunately, the quantities are generally relatively small, and adequate measures can be taken to protect personnel and equipment. However, constant vigilance by the inspection staff of the Division and plant management is required.

There were a number of explosives accidents involving children, the primary cause being carelessness on the part of users of explosives in storing detonators. A warning poster and circular letter were circulated to all contractors who operated licenced magazines under the Explosives Act. Many requests for additional copies of the poster were later received from provincial Departments of Public Works and Highways, logging and paper companies, and hydro power companies. This response should result in greater care in storing blasting caps and a corresponding reduction in these regrettable accidents.

An improved type of delay action detonator, marketed during the year, is perhaps the most important advance made in this field in many years. These detonators have proved most acceptable, especially in quarry operations. When properly used they greatly reduce earth vibrations arising from a series of explosions and at the same time increase the breakage of rock by as much as 30 per cent. The change is in the delay timing which has been greatly reduced.

Chinese firecrackers and fireworks were again imported in large quantities. British fireworks manufacturers became interested in the Canadian market early in 1948 and many types of fireworks of British origin were tested by the Division and authorized for importation. Some of these have already been sold in Canada.

The Division assisted War Assets Corporation in supervising the destruction of explosives and explosive ingredients. One such undertaking involved the disposal of a large quantity of magnesium powder in the Pacific Ocean off Vancouver Island.

A new Table of Distances may result from tests conducted by British authorities during the year. An interim report on the tests is being studied by the Explosives Department of the British Home Office with a view to incorporation of the recommendations in a new Table. Since the inception of the Explosives Act the British Table of Distances has been the recognized authority on these matters throughout the British Commonwealth countries and has been the standard followed in locating sites for magazines and factories. The new Table is likely to be generally adopted.

Explosives Laboratory

The Explosives Laboratory for the testing and analysis of explosives, required in the administration of the Explosives Act and for research, is maintained jointly by the Department and the National Research Council. The laboratories of the Department of National Health and Welfare at Vancouver, B.C., examine and report upon samples of fireworks arriving at the ports of Vancouver and Victoria.

In all, 539 samples were examined on behalf of the Department of National Defence, National Research Council, Post Office Department, Royal Canadian Mounted Police, and the Inspection Service of the Explosives Division, and may be classified as follows: commercial dynamites, 29; military explosives, initiators and ammunition, 34; fusees, fireworks, firecrackers, and toy pistol caps, 462; exhibits submitted by the Criminal Investigation Branch of the R.C.M.P., 5; and general, 9.

Projects and Investigations in Progress

Ammonium Nitrate

An investigation into the hazards attending the storage and shipment of ammonium nitrate fertilizer was started in 1945, when the Department of Transport requested an opinion on the suitability of 6-ply paper bag containers as a substitute for metal drums.

Following two serious explosions of ammonium nitrate in transit at Texas City, Texas, on April 16, 1947, and one at Brest, France, on July 28, 1947, the scope of the investigation was extended by the National Research Council Associate Committee, in an effort to determine the cause of the explosions and to draw up safety regulations. The work done in the Explosives Laboratory is covered in three interim reports. The first is an appraisal of the detonation characteristics of ammonium nitrate as compared with a number of chemical compounds and mixtures used as fertilizer. The second deals with these same reactions in greater detail and compares them with other explosives compounds. The third covers a study of ammonium nitrate in relation to other oxidizing materials, various classes of diluent materials, and effects of gaseous atmospheres on detonation.

An officer of the Division observed five large-scale trials by United States agencies. Both chemically pure ammonium nitrate and coated types, packaged in 6-ply paper bags and in steel drums, in lots of from 3 to 70 tons, were tested in simulated ships' bunkers. Although there were varying degrees of decomposition, there was no detonation, and the trials did not offer any satisfactory explanation of the recent explosions at Texas City and Brest.

Work now in progress is aimed toward making a study of the reaction of ammonium nitrate under all conditions that are likely to be encountered in commercial production and transportation, and toward drawing up suitable packaging and transport regulations.

Railway Fusees

At the request of United States authorities, assistance was given in setting up standard colours and intensity of light for railway fusees and preparing standards for railway track torpedoes. Final specifications will be fixed by regulations under the Board of Transport Commissioners.

Factories

Sixteen factories and storage depots were licensed under the Act, a decrease of two from the previous fiscal year. Three toy cap manufacturers did not renew their licences. The Dominion Arsenal, Quebec, is now licensed under the Explosives Act.

Magazines—Registered Premises

There were 391 permanent and 599 temporary magazines licensed at the end of the fiscal year, compared to 377 permanent and 563 temporary licences in the previous year. Registered premises increased from 49 to 53.

Inspections

	Factories	Magazines	Registered Premises	Unlicensed Premises
Explosives Division Inspectors	27	596	39	859
Royal Canadian Mounted Police ...	—	391	34	6,059

Importation Permits

Four hundred and twenty-six permits and 17 special permits were issued for fireworks, nitrocotton for use in the manufacture of lacquers, propellent powders used in the manufacture of ammunition, and nitro-glycerine for blowing oil wells.

Accidents

On April 4, 1948, the proprietor of a factory manufacturing toy pistol caps was killed in an explosion. An investigation by the Division indicated that the victim was following an unauthorized and dangerous practice in pressing dry sheets of caps at the time of the accident. Recommendations were made for a closer control on this type of firework, both in the manufacture and the provision of experienced operators.

A fatality occurred when a fire started in unlicensed premises where explosives were stored. The victim, unaware of the danger, was trying to put out the fire when an explosion occurred. The Division conducted an investigation.

A number of unusual incidents and minor explosions, in which slight injuries were suffered by workers, was reported by explosives factories. Where the cause was determined, corrective measures were taken by the management.

Inquiries were made regarding the explosion of 120 tons of dynamite on Great Slave Lake. The tug and barges concerned were registered under the Canada Shipping Act.

Reports were received of 145 accidents in the use and handling of explosives, resulting in 34 deaths and 160 injuries. Although most of the accidents occurred in mines, quarries, logging, and construction jobs, more than one-quarter of the total was caused by playing with detonators and other explosives. Children were the chief victims.

Summary

	Accidents	Killed	Injured
Mines and quarries	65	11	65
Elsewhere in industry	42	17	43
Playing with detonators	14	0	19
Playing with other explosives	20	4	27
Miscellaneous	4	2	6
Total	145	34	160

Prosecutions

Twenty prosecutions were instituted under the Explosives Act and Regulations and convictions were obtained in all cases. Fines up to $50 were imposed. Infractions of the regulations were as follows: illegal storage, 19; and failing to keep records, 1.

Ten persons were charged under the Criminal Code with theft or illegal use of explosives and were sentenced to terms up to 2 years and fines up to $100.

Three men were fined for careless handling of explosives under the Ontario Mining Act, and a number of juveniles were fined under city by-laws for causing damage to property or injury to persons by fireworks and high explosives.

Destruction

Abandoned and deteriorated explosives destroyed amounted to 3,780 pounds of dynamite, 2,312 detonators, and 1,000 feet of safety fuse. One hundred tons of magnesium powder, 60,000 tubes of anti-gas ointment, and a quantity of pyrotechnic stores were destroyed by the Division for War Assets Corporation.

Approximately 1,000 pounds of unauthorized fireworks were destroyed at the port of entry.

Radioactivity Division

The decision of the Government, announced in March 1948, to purchase all uranium ores of Canadian origin meeting specified requirements, resulted in a marked increase in the number of samples of such ores received from prospectors for testing. The purchases are made through the Crown-owned Eldorado Mining and Refining (1944) Limited.

Much research was done, with good results, on the extraction of uranium from ores. Most of this was on the ores and products of the aforementioned company, but methods of extraction were also determined for ores from private companies.

A process was developed for the recovery of uranium from ores that were previously considered to be too low in grade to permit of economic treatment. More accurate methods for analysis of low grade uranium products were tested and were modified to be suitable for complex ores. Special methods for the pre-concentration of radioactive ores were developed and tested in the field.

Apparatus and methods were developed to improve the speed and accuracy of measurements of radioactivity in the analysis of ores. One such method is used on a routine basis at the Port Radium plant of the Eldorado company with results closely equivalent to the most careful chemical analysis.

In co-operation with other organizations research work and field tests were conducted on detection of radioactivity in the field.

A simplified method was devised for the analysis of ore in the field by the use of the standard Geiger field counter. Representatives from provincial laboratories were instructed in the technique of Geiger analysis.

Methods were developed for the determination of thorium in ores.

Dominion Forest Service

The research and test work of the Service is part of the constant effort to maintain and strengthen leadership in forestry production, vital to Canada's prosperity. In its offices and laboratories and in its field work, the Service was engaged on problems, some baffling, a few intangible, and many offering promise of early solution. The answers to others were worked out and the results passed on to industry.

Of all the problems, none offers a greater challenge to the research worker and to Canadians as a whole than does that of forest fire-hazard. The average annual toll of fire is more than a million acres of merchantable timber and young growth. The Service intensified its research on this hazard, realizing, however, that carelessness on the part of campers and others remains the chief cause of forest fires, a cause that can be overcome only by education and an awakened public interest in forest protection.

The Service can report a growing recognition by all concerned that the period of "mining" the country's forest resources is at an end, and that if the prosperity of the industry is to be maintained, a program of modern forest management on a sustained yield basis is essential. The increasing interest in this matter is evidenced by the various Royal Commissions set up in recent years to examine the forestry situation in British Columbia, Saskatchewan, and Ontario, and also by the adoption in March, 1948, of a "Forest Policy" by the Canadian Pulp and Paper Association. This development will possibly require even greater attention to silvicultural and forest products research than has been given, and the demands for greatly extended research in all fields of forestry seem likely to increase.

The growing importance of the international field is evidenced by the increasing number of requests for information received by the Service. During the year cumulative quarterly reports of forest production were submitted to the Economic Commission for Europe. An annual progress and program report was prepared for the Food and Agriculture Organization of the United Nations. The Dominion Forester attended a meeting of the Standing Advisory Committee on Forestry of the Food and Agriculture Organization in June, and also the fourth conference of FAO, held in November, as technical adviser on forestry.

The Timber Mechanics Conference held in Ottawa and in Madison, Wisconsin, was convened as a result of a recommendation from the British Empire Forestry Conference of 1947, and was attended by specialists from the United Kingdom, South Africa, Australia, New Zealand, Malaya, Canada, and the United States. Another important conference with representatives of the United States Forest Products Laboratory was held in Ottawa to discuss technical problems related to working stresses for timber.

D. A. Macdonald was appointed Dominion Forester on May 1, 1948, succeeding D. Roy Cameron. Allan Peebles was appointed Chief of the Economics Division near the close of the fiscal year.

Forest Economics Division

Newsprint production set a record of approximately 4,600,000 tons and the production of lumber, estimated at 5,125,000,000 feet, was only slightly lower than in 1947, the record year.

Domestic lumber prices remained at levels resulting from the upward adjustment of prices in September, 1947. Export prices were reduced slightly in the last quarter, particularly in the United States. The price of pulpwood

increased somewhat in the first quarter and then remained firm. The prices of other forest products remained firm, with the exception of plywood, the price of which was somewhat lower owing to poor markets.

The table below gives the average rate of utilization and destruction of merchantable timber during the ten-year period, 1937 to 1946. The cubic foot volume of usable wood refers to merchantable wood only, excluding stumps and tops.

Annual Forest Depletion
Period 1937-1946, inclusive

—	M Cu. Ft. Usable Wood	Percentage	
		Utilization	Depletion
Products Utilized			
Logs and bolts			
Domestic use	929,598	37·0	28·1
Export	33,612	1·3	1·0
Pulpwood			
Domestic use	590,875	23·5	17·9
Export	144,150	5·8	4·4
Fuelwood	718,964	28·6	21·8
Hewn railway ties	12,650	0·5	0·4
Pit props	14,394	0·6	0·4
Poles, posts, rails	33,957	1·4	1·0
Miscellaneous products	32,356	1·3	1·0
Annual utilization	2,510,556	100·0	76·0
Wastage			
By forest fires	292,583	.....	8·9
By insects and diseases	500,000	.....	15·1
Annual waste	792,583	.....	24·0
Annual depletion	3,303,139	.....	100·0

Since the accessible stand of merchantable timber in Canada was estimated in 1945 at 191,348,000 cubic feet, the average annual depletion during the decade amounts to 1·7 per cent of the accessible volume. This may not seem excessive as an average rate, but it must be realized that in many localities severe over-cutting is taking place, whereas the annual growth is not being used on the more inaccessible areas.

A comparison for 1946 (the latest year for which data are available) of the different branches of the forest industry is given in the following table:

Forest Industries
Summary of Principal Statistics, 1946

—	Employees	Salaries and Wages	Net Value of Products	Gross Value of Products
	No.	$	$	$
Woods operations	138,793[1]	277,000,000	324,000,000	413,269,314
Lumber industry	49,352	63,811,260	129,408,392	287,910,057
Pulp and Paper industry	44,967	101,364,636	258,164,578	527,814,916
Wood-using industries	58,377	81,483,876	130,875,168	278,891,885
Paper-using industries[2]	22,475	32,955,910	75,655,142	167,270,628
Total	313,964	556,615,682	918,103,280	1,675,156,800

[1] Man-year basis (300 working days).
[2] Excluding printing trades.

The gross value of production represents the total value of all the individual commodities, and as the products of one branch of the industry may be used as the raw material for another, it contains a duplication of values and to this extent is misleading. For most purposes, the net value of production is more significant as a basis for comparing the values of different industries. It is arrived at by deducting from the gross production the cost of purchased materials, fuel, electricity, and process supplies, the remainder being the real value added by manufacturing.

The increasing importance of the forest industries is indicated by the fact that their net value of production in 1946 represented 7·7 per cent of the gross national product (the sum of national income, depreciation charges, and indirect taxes, less subsidies), as compared to 6 per cent in 1938. The net value of the forest industries in 1946 was 27·4 per cent greater than in 1945 and 196·7 per cent greater than in 1938.

The outstanding importance of forest products in Canada's external trade is shown in the table below. Wood, wood products and paper is easily the outstanding industry in producing a favourable balance of trade, yielding more foreign exchange than any other two industrial groups added together. In these days when Canada is looking for United States dollars, the fact that trade in forest products with that country produced almost $700,000,000 in 1948 is highly important.

External Trade

Balance of Trade, 1948 (excluding gold)

		Balance*
Agricultural products		+ 293,778,602
Animals and animal products		+ 350,222,847
Fibres, textiles and textile products		— 305,065,271
Wood, wood products and paper		
United States	$687,562,577	
United Kingdom	97,607,893	
Other Countries	94,773,089	+ 879,943,559
Iron and its products		— 500,790,478
Non-ferrous metals and their products		+ 240,136,244
Non-metallic minerals and their products		— 511,267,708
Chemicals and allied products		— 38,539,460
Miscellaneous commodities		+ 30,074,398
Sub-total		+ 438,492,733
Exports of foreign products		34,590,583
Total balance from commodity trade		+ 473,083,316

*Excess of exports over imports is signified by +, while excess of imports over exports is —.

The publication, "The Statistical Record of the Forests and Forest Industries of Canada", was brought up to date by the issue of a list of amendments showing the latest available data. The English and French editions of the leaflet, "Canada's Forests, 1949" were revised and distributed to interested individuals and forestry organizations throughout Canada.

Cumulative quarterly reports on forest production and export statistics were prepared for submission to the Economic Commission for Europe.

An annual progress and program report to the Food and Agriculture Organization of the United Nations was prepared in co-operation with the Department of Trade and Commerce.

Forest Air Survey Division

No natural feature is better adapted to detailed study by air photography than the forest, with the result that a comparatively new field, embracing both research and practice, has been opened up. The Forest Air Survey Division, in which the development of technique has gone in hand with the forest mapping of federally administered lands and other territory of direct concern to the Dominion, was among the earliest explorers of this field. The results of its work are being increasingly utilized in the forest industry, the provincial forest services, and to some extent in foreign countries.

Detailed forest maps and timber estimates were prepared from air photographs, supported by considerable field work. The areas included six Indian reserves totalling 110 square miles; Riding Mountain National Park, involving 300 square miles; almost all of the Green River Management area of 360 square miles near Edmundston, New Brunswick, the scene of forest management studies with particular reference to the control of the spruce budworm; 130 square miles in the Aubinadong area north of Blind River, Ontario, where a test is being made in estimating quantities of saw-timber directly from specially taken air photographs; and about 15 square miles surrounding the Spray Lakes, Alberta, where timbered areas will be flooded as a result of power development.

General forest inventory maps were prepared of 800 square miles in the Eastern Rockies Forest Conservation area where their use in fire protection is of great importance; of about 12 square miles in the Banff National Park, and of about 420 square miles in the New Glasgow area, Nova Scotia, the last being for use in preparing a sample photolithographic map. For forest inventory purposes, it has been found that such maps are cheaper and better than those prepared by the former method of making tracings from which prints on sensitized paper were made.

Field data were collected for use in a preliminary attempt to ascertain the correlation between crown closure and the stand density index, both of which are forest density criteria, the former being obtained directly from the air photographs. Field and office work was continued in the correlation of measurements of the crown and bole of the tree and in the preparation of tables showing timber quantities in relation to various heights of stand and degrees of crown closure. The preparation of devices to measure the fine tree images in air photographs was continued and advances were made in the development of instruments for plotting timber type lines. A promising method of using vertical lines, or "poles", which may be fused in the stereoscopic view for the measurement of tree images was brought to the stage of practical tests. Articles were published on the shadow height calculator, prepared for the determination of tree heights from shadows in air photographs; the Nash scale, devised for measuring the width of tree crowns in the field; the forestry tri-camera method of air photography; the photoelectric planimeter, developed for the measurement of map areas; and on the general aspects of forest air survey as required for the United Nations Scientific Conference on the Conservation and Utilization of Resources.

Excellent results were obtained in taking large-scale sampling photographs by the forestry tri-camera method. The superior information supplied thereby is largely applicable to the smaller scale photographs of the whole area. Jointly with the Canadian Society of Forest Engineers, the Division continued its efforts to secure standardization in forest classification.

Tuition in the technique of forest air survey was provided to a number of representatives of provincial forest services and timber-holding companies, and to consulting foresters.

Air photographs taken by the forestry tri-camera method of about 800 square miles of Indian reserves and other Indian lands, forest experiment areas, and the Fundy National Park will be particularly applicable to detailed quantitative estimating. Other photographs as taken in the Dominion program of air survey will provide valuable information for forest mapping.

Silvicultural Research Division

Research on the problems arising from the management of Canadian forests on a sustained yield basis and development of silvicultural methods suitable for the various stands in the different forest regions are the Division's chief functions. The main fields of investigation are forest botany, forest ecology, silviculture, forest mensuration, and forest management. Field work, greatly reduced during the past ten years, was expanded and good progress was made on all projects. Several long-term projects were completed and the results were prepared for publication.

The Division submitted the annual report on tree breeding to the National Research Council. This work is being continued on a maintenance basis pending appointment of a qualified tree breeder. A second arboretum was established at Petawawa to take the material now in the nurseries.

Field work connected with the survey of regeneration on cut-over and burned-over forest lands across Canada, begun in 1946, was completed and a report showing the results is being prepared for publication. Generally speaking, the main pulpwood species, spruce and balsam fir, are reproducing satisfactorily on cut-over lands throughout eastern Canada. However, on burned-over lands regeneration of these species is inadequate and the future crop cannot be expected to yield quantities comparable with the original forest. The regeneration of these species on both cut-over and burned-over lands in western Canada is unsatisfactry. The regeneration of jack pine on cut-over lands is unsatisfactory throughout Canada. However, on burned-over lands its regeneration is satisfactory provided that a seed supply is available.

The detailed investigation into the effects of site and seed-bed conditions on regeneration were expanded and several new projects were initiated. In the Maritimes, the Division began a study of seed-bed development and the succession of lesser forest vegetation. In Ontario, it started a project aimed at improving jack pine regeneration following logging, by exposing the mineral soil and by broadcast burning in co-operation with one of the pulp companies. At the request of the Provinces of Manitoba and Saskatchewan, a study was made of the effects on regeneration of the various methods used in disposing of logging slash. Apparently the different methods of slash disposal did not have any effect on regeneration. This study is being continued. In Alberta, experimental treatment of the forest floor to obtain reproduction of a desirable species in an understocked mixedwood stand shows considerable promise.

Several projects on the general study of the development of reproduction stands were in progress under the headings, "Relation of Stocking to Size of Quadrat", "Reproduction Surveys for Forest Management Purposes", and "Recurrent Surveys of Forest Reproduction". In this work data from both the Petawawa Forest Experiment Station and co-operating companies are being used.

The Division completed the soil survey of portions of the Kananaskis Experiment Station. The final map delineates the complex mountain soils found on the area, together with their depths and surface texture. The report of the work should be of practical value in the study of forest protection and silvicultural problems on the eastern slopes of the Rocky Mountains.

A report to be published shortly was written on forest development on the Goulais River observation area in the Algoma district of Ontario. It is the third in a series of publications on this forest and gives an account of the development of the softwood and mixedwood stands for a period of 36 years following cutting of softwoods and development for 26 years on areas disturbed by fire. As extensive areas in this section of Ontario have a similar history, the report should be of value in preparing working plans for this region.

The remeasurement of all experiment station permanent plots concerned with projects in the fields of intermediate and harvest cuttings was continued, and new plots were established where necessary. Research notes were published on the "Development of White Spruce Stands Cut to Different Diameter Limits in Northern Saskatchewan", and "Forest Conditions After Logging on the Quebec North Shore". A report was prepared dealing with the results of an experiment in western Quebec in which defective trees and underbrush were removed from a stand of northern hardwoods. A considerable increase in the growth of yellow birch and maple resulted from this treatment. A red pine plantation near Rockland in eastern Ontario was remeasured and the data show continued benefits in growth rate because of the thinnings made some years previously.

A three-year study to obtain information regarding present forest conditions was initiated and plots were established to provide for a future remeasurement that will give a reliable index of growth in Riding Mountain National Park. This area is typical of the important mixedwood stands in Manitoba and Saskatchewan.

The results of an investigation of growth in selectively cut spruce stands on the eastern slope of the Rocky Mountains bear out the contention that spruce stands in Alberta should be managed on a selection cutting basis. The main object of this investigation was the development of a management policy which would ensure reproduction, reasonably frequent cuts, and a fair return to the operator.

A line-plot survey was made of five square miles in Laurentides Park in Quebec and permanent plots were established for recording the growth at ten-year intervals. The results are to be correlated with those from the observation area established last year, as part of a plan to find out how long it will be before a second cut is possible after clear-cutting in the Boreal Forest Region.

Work in forest mensuration in connection with the growth and yield of white pine and red pine at Petawawa has resulted in the development of many new approaches to the techniques of measurement and analysis. One aspect of the problem, "The Form-Class of White Pine and Jack Pine as Affected by Diameter, Height and Age" was completed and published as a research note.

The stand density yield method of preparing yield tables to predict the future yield and composition of mixed forest stands continued to interest the forest industries. Plans were under way to begin a study of this nature in the Thunder Bay district of Ontario. Seven of the larger companies in the district are taking part in the negotiations and it is hoped to have a survey party in the field in the summer of 1949. Several other pulp and paper companies are selecting and measuring plots in co-operation with the Forest Service, in order to determine growth and yield for their own districts.

The fourth in the series of research blocks was laid out in the Green River Forest Management Project in northern New Brunswick; the field notes for the block established last summer were compiled; and all of the management area was photographed by the tri-camera method. Interest in the project continues to increase.

New compartments were marked for cutting in the twelve demonstration woodlots established in the Maritimes with the co-operation of the Department of Agriculture. In Nova Scotia, the sample plots established on farmers' wood-

lots in 1928 were examined for the last time and the project will be considered closed. A similar examination was made of the plots established under the National Forestry Program in 1938 and 1939 on Prince Edward Island. A working plan was completed for the demonstration woodlot on Hart Hill at the Valcartier Station.

A revised working plan for the Petawawa Forest Experiment Station that will form the basis for activities in the field of forest management for this station for the next ten years was completed. Satisfactory progress was made on revised working plans for the other four stations.

A field reconnaissance of the timber resources in the Sault Ste. Marie, Parry Sound, Manitoulin, and Nipissing Agencies was made at the request of the Indian Affairs Branch.

Publications

Silvicultural Research Notes

No. 85	White Spruce Stands Cut to Different Diameter Limits in Northern Saskatchewan	V. H. Phelps
No. 86	White Spruce Reproduction in Manitoba and Saskatchewan	V. H. Phelps
No. 87	White Spruce Reproduction in Manitoba	G. H. D. Bedell
No. 88	Forest Conditions after Logging on the Quebec North Shore	L. A. Smithers
No. 89	Form-class of White Pine and Jack Pine as Affected by Diameter, Height, and Age	G. H. D. Bedell

Silvicultural Leaflets

No. 25	Requirements for Permanent Line Plot Surveys	A. Bickerstaff
No. 26	Increment Hammer	A. Bickerstaff
No. 27	Calculation of Stand Density Index for Mixed and Two-aged Stands	G. A. Mulloy
No. 28	Reduction of Error in Line Plot Tally	C. C. Thomson
No. 29	Scarification to Induce White Spruce Regeneration	V. H. Phelps
No. 30	A Possible Source of Error in Determining Converting Factors in Four-Foot Wood	D. E. Nickerson
No. 31	A Simplification of the Continuous Inventory Method of Calculating Diameter Growth	L. A. Smithers

Forest Protection Division

Forest Fire Losses

As early as 1918, records of forest fire losses were compiled by all the principal forest protective agencies in Canada. Following the disastrous fire season of 1929 an effort was made to prepare these statistics on a reasonably uniform basis throughout the Dominion. The fire losses in Canada for that year were, for the first time, compiled and published by the Federal Forest Service with the co-operation of the Provincial and Dominion agencies concerned; and during the past 19 years the annual reports of the Forest Service have contained forest-fire statistics for all Canada. Nevertheless, the Dominion forest-fire statistics are still far from complete, particularly as regards evaluation of the less obvious forms of damage caused by fires.

An awakened public interest in forest conservation has stimulated a demand for the publication of these statistics earlier than is possible in departmental reports. The educational value of such statistics may be of great assistance in the prevention of forest fires, and this value is enhanced if the information can be released to the public while it is still of interest. Moreover, although the Dominion Forest Service is responsible for compiling and

publishing these data, the organization and administration of forest-fire protection in Canada is largely a function of other agencies. These considerations led to the publication of statistics for the 1948 fire season as a separate leaflet, which was released at the earliest date consistent with the requirements of the various contributing agencies.

Uniformly good or uniformly bad fire conditions have seldom prevailed over the entire country in any year. In this respect the fire season of 1948 was no exception. A "focal point" of critical fire danger developed early in the summer north and east of Lake Superior, its intensity diminishing gradually to the west and more rapidly to the east. As a result, Ontario had one of the worst fire seasons in recent history, and losses in Manitoba were the highest in 19 years. Conditions were close to normal in Quebec, Saskatchewan, Yukon and the Northwest Territories, while in Alberta and British Columbia fire losses were well below average. They were much below normal in New Brunswick, and were exceptionally light in Nova Scotia.

Forest Fire Research

The principal area of field research in forest fire hazard by the Forest Service in 1948 was the Whiteshell Forest Reserve, Manitoba, where a fire-hazard research station was established in co-operation with the Manitoba Forest Service. Valuable data were obtained from studies of fuel moisture and inflammability in relation to weather conditions in eight of the more important fuel types of the Precambrian region. Articles were published dealing with the effect of topography on temperature and relative humidity readings, and with a simple device for measuring dew, based on studies conducted at this station. Several years' data will be required, however, before fire danger tables specifically adapted to the region can be prepared.

A report was issued dealing with the effect of inversions and night weather conditions on forest fire danger in mountainous country as determined from research conducted at the Kananaskis Forest Experiment Station in Alberta. Field studies at Kananaskis provided additional data on inversions and on moisture changes in slow-drying fuels. Further studies will be necessary, especially on the occurrence, distribution, and prediction of weather inversions.

Fire research at the Petawawa Forest Experiment Station in Ontario was intensified. Fuel moisture studies were continued, and new, slow-drying moisture indicators were included for the first time. The Hurst integrating atmometer, used as a simple indicator of fire danger, was introduced experimentally at two other stations. Additional plots were established for the study of weed-killing chemicals on fire-guards and road shoulders. A second report on wetting agents and fire-retardant chemicals for use in fire suppression was issued. Experimental fires were set in previously prepared jack pine slash areas as part of a series to determine the effect of various slash-disposal methods on the fire hazard. The data have not yet been analyzed. A preliminary study was made of the possibilities of polaroid filters as aids to fire detection. The forest-fire control plan for the Petawawa Station, prepared in 1946, was revised and issued in bulletin form.

Field research in fire hazard in New Brunswick has been superseded, temporarily, by the analysis of actual fire experience in that Province in relation to the danger index. Studies now in progress indicate that final fire danger tables can be prepared with relatively minor modification of existing ones, and that little or no additional field data will be necessary.

Work was continued on a study of standards of adequate forest fire protection for the various forest regions of Canada and a report on this subject is being prepared. Performance tests were carried out on two new types of portable pumping equipment. Weather and fire-danger records from the National Parks and Forest Experiment Stations were checked and analyzed.

Fire danger tables for the east slope of the Rocky Mountains were provisionally revised to include the effect of abnormal night-weather conditions, and a research note on fire-danger forecasting, now in its third edition, was re-issued in revised form.

Forest Products Laboratory, Ottawa

The Laboratory does research on the properties of Canadian woods and on problems connected with the more efficient utilization of timber products, and works closely with the wood-producing and wood-using industries. This close association resulted in a high level of research activity and in a continuation of requests for special investigations and for technical information. The research work was reorganized into four main divisions, namely, Timber Mechanics, Wood Preservation, Wood Chemistry, and Wood Utilization.

Many of the research problems were international in scope, involving co-operation with other laboratories and with standardizing bodies. Of special interest was the Timber Mechanics Conference which met for two weeks in Ottawa and for two weeks in Madison, Wisconsin, during the autumn of 1948. This body was formed as a result of a recommendation from the British Empire Forestry Conference of 1947, to promote the standardization of methods for testing the mechanical and physical properties of wood. It was attended by specialists from Great Britain, South Africa, Australia, New Zealand, Malaya, Canada, and the United States.

Another important conference with representatives of the United States Forest Products Laboratory was held in Ottawa to determine methods of arriving at safe working stresses for timber in building construction, and to discuss the implications of increases in working stresses for structural timber that had been made by trade associations in the United States.

For the third year in succession a course of lectures and demonstrations, with visits to selected industrial plants, was given to a group of Assistant Trade Commissioners in training prior to their being posted overseas.

The following research work of special interest was undertaken by the various divisions of the Laboratory.

Timber Mechanics Division

Further data were collected on the mechanical and physical properties of Canadian woods, in which work rock elm, eastern hemlock, and red pine were tested.

Three new forms of sheet-metal framing anchors were tested to determine their strength properties when used for joining wood framing elements for housing. These framing anchors permit economies in lumber and provide greater joint strength than that obtained from the usual type of joint used in house construction. Red pine and white spruce were used, as they are representative of the species used most frequently in house construction in Eastern Canada. Tests on Douglas fir had been carried out previously in the United States.

The construction of 32 glued laminated railroad ties was completed and the ties were incised, treated with preservative, and laid in track to determine their serviceability. These experimental ties were constructed to show the possibility of using smaller timber for railroad ties, if the available supply of tie timber should be materially reduced. Satisfactory service trials will indicate the possibility of adapting this type of laminated construction to other timbers of interest to the railroads, such as bridge and trestle timbers of large sizes, the cost of which is rapidly increasing.

The 47-foot span laminated three-hinged wooden arch was kept under 48,600 lbs. of load during the first year following its erection. The results of this severe test are encouraging.

A scale model three-hinged arch was designed in which the members were formed without bending. The arch sustained a maximum load of more than double the design load. By modifying the design, an even better result is expected. Arches of this type are comparatively simple to make and should be useful for the construction of buildings of medium span requiring clear space uninterrupted by supporting pillars. They would be adaptable to farm buildings such as barns.

Jointly with the Canadian Standards Association, draft revisions of the specifications for eastern white and western red cedar poles were prepared, to bring them into line with those of the American Standards Association specifications, thereby removing export difficulties.

Much analytical work was done, aimed at correcting any imperfections in grading rules for structural timber. The strength of a timber may be affected much more by the position of a knot than by its size. This factor is not adequately dealt with in present grading rules with the result that the allowable working stresses are much lower than would be the case if the low-strength pieces could be graded out. If this could be done, substantial economies in timber construction would result.

Experimental work was done on the bonding of moulded plywood for boats, on methods of producing curved plywood and of eliminating warping, and on the properties of special plywood constructions. Particular attention was given to the problems of bonding plastic laminates to plywood. Tests were made on plywood for the Armed Services and for other government departments, and assistance was given in the preparation of plywood specifications for these organizations.

Newly developed wood adhesives were tested to provide the wood-using industries with data on their properties and application. Studies were made to develop improved test methods for evaluating the strength and durability of plywood glue bonds. An investigation was started to determine the relative weathering properties of plywood and plywood glues under service conditions and to check the accuracy of accelerated laboratory tests now being used.

Studies of industrial techniques in the use of dielectric heating were continued, particularly in the field of bonding curved plywood. To take advantage of the rapidity with which glue lines are cured by this process, a set-up was designed using air-operated pressure cylinders to permit rapid loading and unloading.

In the study of methods for edge-gluing lumber to make core-stock, special attention was given to determining the optimum operating conditions and limiting factors involved. The first phase, dealing with permissible glue-spreads, was completed. A study was made of the dielectric properties of wood necessary for the further evaluation of this heating process. Douglas fir was thoroughly investigated and some work was done on sugar maple and white spruce. Analysis of the data obtained shows a definite relation between dielectric properties and density. The establishment of this relationship will permit an extension of theory in connection with further investigations.

The use of dielectric heat as a substitute for kiln-drying appears to be of value only for such special applications as drying refractory woods (oak, beech, etc.) in baulks of considerable thickness, or in short-length stock as is used in making shoe lasts and bowling pins. The drying of rough-turned shoe lasts of sugar maple was studied at the request of industry.

The testing and re-designing of containers at the request of industry and the Armed Services increased in volume. The most frequent requests were in connection with packaging vitreous enamelled goods such as electric and coal

ranges. Glassware containing pharmaceuticals and similar goods and a variety of household enamelled goods, packed in cartons, were also submitted for examination and testing of the packing. In most instances, modifications of the packaging method which improved the rigidity and protective value of the package were suggested.

The problem of the cost of single-journey containers for use between manufacturer and assembly plant has become of increasing importance. The possibility of designing a rugged demountable box was explored, and a container which appears to offer a solution to the problem was designed. The special extrusions necessary to make it on an experimental basis are in process of manufacture.

Wood Preservation Division

Preservatives

Full-cell creosote treatment of piling material with a large sapwood ring gives adequate protection against marine borer attack in coastal waters. A protective coating has been developed experimentally in the Laboratory that can be easily applied to wood material for temporary use in salt water, as for construction work. The coating consists of one or two coats of cold-setting synthetic resin glue to which is immediately applied medium fine dry sand. The synthetic resin is allowed a few days to set and polymerize before being placed in the water. With the co-operation of the Federal Department of Public Works, pieces of wood were coated and installed in a test rack at Charlottetown, P.E.I., where marine borer attack is particularly severe.

Extensive laboratory and service tests were started on distillate obtained as a by-product in the manufacture of briquettes from lignite coal in Saskatchewan and on standard creosote to determine their relative preservative value. Interest in this lignite creosote has been heightened because of the clean treatment it gives, thereby making it particularly desirable for poles to be used in urban areas. However, the distillate does not quite meet the specifications of the American Wood Preservative Association for standard creosote.

Work was continued on recording the life of treated and untreated timbers under a wide range of service conditions. More than 1,100 tests have been recorded, of which 295 have been concluded and 813 are active. The latter were examined by co-operating companies and departments, and the results of the examination were forwarded to the Laboratory where they were classified and recorded. The results of concluded tests and the status of active tests are available to all timber users and are of benefit to engineers designing large timber structures and installations, and to farmers concerned about the replacement of decaying fence-posts and farm timbers.

During the year, 1,200 fence-posts of different species were treated with varying solutions of two relatively new wood preservatives to supplement previous tests with standard preservatives and to demonstrate the possibility of using available species of low natural durability. By means of relatively simple "home" treatments, the latter can have their life extended by many years.

About twenty years ago the Laboratory treated 1,000 cross-ties of ten different species with zinc-meta-arsenite as an experimental project in co-operation with the Canadian National Railways. To date only three of these treated ties have been removed from the track because of decay. To determine the preservative value of the chemicals remaining in the ties, some ties were withdrawn from the track to provide material for a comprehensive series of tests.

Pathology

A study of end-coatings was initiated in connection with the investigations being made of means of preventing the estimated $2,000,000 annual loss which occurs in birch logs in storage. Thirty compounds giving promise of service as end-coatings to protect logs from end-checking and decay were tested on birch sticks exposed at the Laboratory. Eleven of the thirty coatings were considered worthy of further study, using white birch logs so stacked as to give a range of exposure conditions. Later, the best of these coatings will be tested under commercial logging conditions.

The successful outcome of a project concerning the use of red-stained jack pine ties and poles that was started in 1929 can now be reported. In that year an experimental track of 397 red-stained ties containing *Fomes pini*, the fungus which in the early stage of attack stains jack pine red and later produces white pocket rot, was established in main line service near Ottawa. Half of these ties had been creosoted. At regular intervals, beginning in 1931, groups of these ties were removed and studied. In 1948, nineteen creosoted ties were removed and analysed, leaving only 18 to be removed in 1949, when the project will have been completed. Results obtained to date are considered to be sufficiently conclusive to warrant the utilization of red-stained wood, and red-stained ties and poles are now being accepted, whereas formerly such wood was rejected on the assumption that the fungus would continue to develop in ties and poles in service, would produce pocket rot, and would thus cause rapid deterioration of the timber. It is estimated that 30 to 35 per cent of the jack pine cut contains red-stain, and thus the investigation has assured the conservation of large and valuable supplies of timber.

The possibility of using white elm as a substitute for rock elm, now in short supply, was under study. Laboratory and field tests were continued to determine the relative resistance to decay of the two species. Blocks of rock elm were subjected to the attack of *Lenzites trabea* (a brown rot fungus) and *Polyporus versicolor* (a white rot fungus) in pure culture in soil. The cultures were incubated for four months and the loss in weight of each block was then determined. These results will be correlated with those previously obtained for white elm.

Further studies were made on sapwood stain preventives. A proprietary compound containing mercury and sodium pentachlorphenate proved very efficient in preventing stain in the sapwood of red pine and white pine.

In continuation of the study of fungi responsible for the decay of different species of wood, particular attention was given to rots and stains of birch. In the heartwood of freshly felled birch, *Stereum murrayi* and *Torula ligniperda* were common. Storage rots yielded *Polyporus adustus, P. hirsutus, P. versicolor, Stereum purpureum, Peniophora* sp., and some unidentified fungi. *Pholiota adiposa* was obtained from birch and elm. *Peniophora gigantea* was found causing extensive decay in pine pickets in storage. *Coniophora cerebella* was the most common cause of decay in elm test pickets. *Lentinus lepideus* and *Lenzites saepiaria* were isolated from jack pine ties.

A series of wood block cultures was set up in soil to determine the relative importance in causing secondary rot in jack pine of some thirty fungi previously isolated from jack pine ties removed from service. The study of brown stain and storage decay in the sapwood of red pine and jack pine was continued.

Wood Chemistry Division

Studies were continued to extend fundamental knowledge on the chemistry of barks, including reasons for the inapplicability of the chlorite holocellulose procedure to bark and also the difficulties encountered in pulping certain barks to a low "lignin" content.

Sodium chlorite in acid solution was used successfully to isolate the total carbohydrate fraction (holocellulose) of wood. This method when applied to barks has not proved entirely satisfactory because of high carbohydrate losses during the isolation process and of the presence in barks of varying amounts of an insoluble cork-like material. Barks investigated in this way were: black spruce, white spruce, balsam fir, Douglas fir, and western red cedar. The insoluble material in black spruce bark, believed to be related to the suberin of cork, was isolated by successive treatments with sodium chlorite and 72 per cent sulphuric acid. On saponification, it yielded an unsaponifiable fraction containing carbohydrates, and a saponifiable fraction made up of fatty acids, resin acids, and lignin-like material. One fatty acid fraction obtained was a white crystalline product melting between 79° and 89° C., with an iodine number of 4·7 and an acid value of 254. This and other fractions were under further study.

The manufacture of fibreboards from mill-waste was studied, particularly to determine whether the disc refiner available at the Laboratory is satisfactory for defiberizing wood waste, and also to develop methods of utilizing bark and wood waste from pulp-mills and sawmills. Improvements were made in this refiner by the addition of a screw-feed arrangement and a water jet through the housing. Using the refiner, an investigation was initiated to determine the suitability of cedar shingle mill-waste for the manufacture of an insulating type of structural board. The shingle waste was separated into bark, shingle hay, and wood. Work to date indicates that good quality boards may be made from either the bark or the wood, but not from the shingle hay. Greater utilization of the general run of mill-waste as a raw material for pulp and paper manufacture is the primary goal of an experimental project that was initiated to develop mechanical methods of separating wood from bark in such waste. The work is based on the fact that some types of wood waste have low value as raw materials because of their high content of bark. Three commercially important forms of wood waste were chosen for initial experiments, namely, white spruce (slabs and edgings); western red cedar (shingle mill waste); Douglas fir mill waste (hogged fuel). In work thus far, a considerable degree of separation of wood and bark of these species was effected either by the use of a wind-blast method, or by passing through a disc refiner and screening.

Experiments on the electrolysis of sulphite waste liquor were undertaken in an attempt to solve the problems of utilization and disposal of the large quantities of this liquor that are produced in the sulphite pulp process. No satisfactory method is available for the complete utilization of the materials contained in this liquor, and its disposal is becoming increasingly difficult. The liquor was subjected to the action of direct current in a diaphragm cell. Attempts to extract the electrolytes obtained with benzene and carbon disulphide yielded only small amounts of a light brown oil. Vacuum distillation of this oil caused its decomposition. Several experiments were carried out toward reducing the calcium content of the sulphite waste liquor. For these experiments a new type of cell was designed, by use of which it was possible to remove continuously calcium salts from the sulphite liquor. The results indicated that it might be possible, in commercial practice, to remove part of the troublesome calcium salts from waste sulphite liquor by electrolysis, and thus permit of the evaporation and subsequent burning of the residue without excessive scaling troubles.

Crystalline glucose, relatively free from pentoses, was prepared from wood sugars produced by the hydrolysis of Douglas fir wood in a small experimental Scholler process plant. In the preparation of the glucose a method for purification of the wood sugar solution was developed whereby resinous impurities were removed by a much shorter procedure than was previously reported in the literature. At a conference held at the Laboratory with representatives of the Tannin Association of Canada and the Ontario Research Foundation to discuss the possibility of developing Canadian sources of tannins, it was decided

that the most likely source is the bark of eastern hemlock, western hemlock, spruce, and Douglas fir. Arrangements were made for a co-operative study to determine the qualities of tannin from spruce and Douglas fir in commercial-scale tanning. Canada now imports practically all of its tannin needs.

Wood Utilization Division

Logging and Milling

Continuing the study of sawmill waste and its utilization, and the effect of log diameter on lumber manufacture, a field party carried out studies at 24 sawmills in Ontario, Quebec, and New Brunswick. These mills were selected to obtain adequate sampling of the seven different types of sawmill in operation in the region studied. A report covering the results of the studies for the portable type sawmill was prepared and given wide distribution. Computation of the field data for the other types of mills was progressing.

These sawmill investigations also gave interesting information on particular practices and their effect upon production.

A preliminary survey of representative sawmills was made in Saskatchewan and Manitoba to determine whether detailed studies, similar to those made in Eastern Canada, will be necessary. The survey indicated that such studies will not be required.

A new phase of research for this Laboratory was initiated with the appointment of a logging engineer to undertake work in the field of logging waste.

Lumber Seasoning

Development of efficient schedules for kiln-drying different species and sizes of lumber was continued, in which work experimental charges of aspen poplar, beech, red oak, willow, eastern hemlock, and white pine were kiln-dried. A small cross-circulation drying chamber, completed during the year, proved highly satisfactory for experimental runs of this nature.

The preparation of laminated blanks to be shaped into artificial limbs was completed. The condition of these blanks after seasoning was so satisfactory that a considerable quantity of willow logs is being obtained by the Department of Veterans Affairs to be used in the manufacture of laminated blanks for this purpose.

Four kiln-drying courses, each lasting a week, were attended by 78 representatives of firms engaged in primary and secondary lumber industries, from Nova Scotia to Alberta. The courses covered all phases of lumber seasoning, combined with discussion periods and visits to typical lumber industries.

Wood Technology

Field work was completed on the large-scale co-operative experiments on the chemical treating of standing trees initiated in 1947 on the woods operations of a paper company in northern Ontario. The computation for the 230 test groups covered by this investigation was also completed.

Results show that treatments with a soluble arsenic compound were the most effective in facilitating removal of bark when trees were felled and peeled in the autumn after treatment. Trees treated during June and July peeled easily by September of the year of treatment, while treatments made during the late summer were not effective until a year following the application of chemicals. Chemically treated trees of the coniferous species, especially jack pine and balsam fir, showed the greatest reduction in weight. Jack pine treated in June and felled in September of the year following treatment showed an average reduction in weight of 17 pounds per cubic foot. Trees of the broad-leaved species generally showed no appreciable reduction in weight. Various reports on the effect of chemical treatment on ease of peeling, reduction in weight of wood,

effect on quality of wood, and the effect on improving the buoyancy of wood were prepared. A report on chemical treatment of trees was also prepared for presentation at the United Nations Scientific Conference.

At the request of the pulp and paper industry, work was commenced on the preparation of photomicrographs of Canadian pulpwood species to illustrate their typical structure, for use in a publication on industrial standards for pulpwood.

Microscopic study of the effect of nails on wood was made to ascertain why the holding power of nails decreases significantly in the course of time.

Publications

Forest Service Circulars—

Design of Wooden Boxes (revised edition)—39. ..... R. S. Millett
The Strength of Jack Pine Poles Infected with Pocket Rot—65. ..... D. E. Kennedy and W. E. Wakefield

Technical Reports—

Manufacture of Veneer and Plywood..... W. E. Wakefield
Types of Dry Kilns ..... R. S. Millett
Importance of Control of Moisture in Wood to be Glued with Room-Temperature-Setting-Urea-Formaldehyde Resins ..... E. G. Bergin
The Relationship of Log Diameter to Lumber Recovery and to the Time Required to Produce Lumber by Sawmills in Eastern Canada—Preliminary Report. G. E. Bell
The Effect of Moisture Content on Gluing ..... E. G. Bergin
Trip-L-Grip Framing Anchors ..... J. M. Rudnicki and D. E. Kennedy

Reprints of Papers—

Examination of Seven Ground-Line Treatments and One Butt Treatment on Eastern White Cedar Poles after Six Years' Service ..... J. F. Harkom, M. J. Colleary and H. P. Sedziak
Widening Uses for Wood Waste ..... T. A. McElhanney
Use of Wood for Heating Logging Camps ..... J. H. Jenkins
Seasoning by Dielectric Heating ..... D. G. Miller
Chemical Composition of Bark and Its Utilizaion.... H. Schwartz
Chemical Treatment of Trees ..... D. C. McIntosh
Panels for House Construction ..... W. Thornber

Magazine Articles—

Construction and Testing of a Glued Laminated Wooden Arch of 47-Foot Span—Forestry Chronicle, June, 1948 ..... D. E. Kennedy
Drying of Wood by Dielectric Heating—Timber News (Great Britain), March, 1949 ..... D. G. Miller
Hardwood Surfaced Laminated Flooring—Timber News (Great Britain), July, 1948 ..... C. L. Moon and W. E. Wakefield

Pulp and Paper Research Institute of Canada

The Montreal Laboratory of the Forest Products Laboratories is a part of the Pulp and Paper Research Institute of Canada, sponsored jointly by the Dominion Government, the Canadian Pulp and Paper Association, and McGill University. The work of the Institute is supervised by a general director responsible to a Joint Administrative Committee consisting of representatives of the three constituent bodies.

Fundamental Research Studies

Two tentative new methods for investigating the physical structure of cellulose were developed in an intensive study of the causes of the wide differences of cotton and the various types of wood-pulps in their suitability for specific uses such as paper making, or the manufacture of cellulose nitrate, viscose, or acetate rayon.

This structure influences the course of most of the chemical reactions involving cellulose or starch, and also, therefore, the composition of the chemical derivatives produced. Studies of the chemical structure of cellulose and starch oxidized with chromium trioxide were therefore made, together with others on the nitration of cellulose and its esterification with crotonic anhydride. Two supporting researches dealt with glucose nitrates and other glucose derivatives.

A few years ago the Institute developed the first method of isolating lignin in a nearly unaltered chemical state, thereby opening up the possibility of studying its properties without the technical difficulties caused by the presence of the other wood components. During the fiscal year this possibility was exploited by continuing studies on the oxidation of the lignin with potassium permanganate and chromium trioxide. Studies of the bleaching action of sodium chlorite, and of the pulping action of sodium bisulphite on this lignin, were commenced. Good progress was also made on a supporting research on the oxidation of simple lignin analogues, like vanillin, by the new bleaching agents, sodium chlorite, and chlorine dioxide. The object of research on lignin is to learn more about its chemical nature in the hope that such knowledge will eventually improve pulping technique and suggest economic large-scale uses for what at present constitutes one of the biggest waste-disposal problems in Canada.

The Institute has been searching, so far without success, for some chemical agent that can penetrate a log and reduce the natural cohesion of the wood to a point where mechanical grinding in which about 99 per cent of the energy applied is wasted would not be necessary. In contrast to aqueous ammonia, anhydrous liquid ammonia swells and plasticizes the cellulose in wood, although not intensively enough for the ultimate object in view. Present research has concentrated on studying the chemistry of the carbohydrate components leached out of the wood by the ammonia.

In research aimed toward salvaging at least some of the chemical constituents of wood bark, upwards of 1,000,000 tons a year of which is disposed of as waste, much progress was made in isolating and identifying individual substances present in both the fatty and the aqueous extracts obtained from 600 pounds of white spruce bark.

Applied Research Studies

An experimental method of measuring the flocculating tendency of fibres in an aqueous medium was developed and was successful within the limitations of the apparatus. A new apparatus was being designed to extend the field of application of the method. Theoretical work was done on the mechanical and electrical behaviour of the fibres.

An investigation of the nature of the variation in optical density of paper was being carried out by slowly scanning a sample to ascertain the variation in its transmission of light. This was being compared with the flocculation measurements of the pulp from which the paper is made to see if any definite relationship exists.

Development of the liquid permeability method of measuring the specific surface of pulp suspensions was completed. Though no correlation was found between specific surface and the mechanical properties of sheets formed from the pulp, it correlated fairly well with pulp freeness. However, the method provides a new means of measuring the degree of dimensional swelling of the fibres and is a tool of considerable promise in seeking the source of paper strength.

The relation between cellulose and various liquids and vapours, especially water, was under study, particularly in reference to their rate of flow through sheets of cellophane subjected to various types of swelling treatment. It was

found that the permeability of water vapour depends greatly upon the degree of swelling, on the relative humidity of both sides of the sheet, and on the previous condition of the cellophane.

A careful study was made to determine if cellulose which had been moistened with water and then washed with an organic liquid and subjected to thorough drying retained some of the original water. Using acetone as the organic liquid, it was found that a small amount of water remained in the cellulose and could be removed only by humidifying and drying it again.

Investigation of the grinding of wood for pulp was directed almost entirely toward the fundamental aspects of the manner in which this occurs. It is hoped that this research will shed light on the cause of the disintegration.

The investigation of variables in alkaline pulping was continued, using Douglas fir as the raw material and studying sulphidity.

The relation between the surface oil resistance of paperboards and the gloss of the resulting printing on these boards was investigated. A reasonable degree of correlation was found, higher gloss being obtained on board of high surface oil resistance.

Continuing the study of methods of separating pure compounds or concentrates of similar compounds from sulphite waste liquor, the Institute found that by selective extraction in an electrical ion exchanger, it was possible under exceptional conditions to obtain an almost pure colourless dilute sugar solution. A modification of the process later gave encouraging results. An apparatus and a technique were devised for withdrawing electrolytes from a liquor sample, leaving the sugars behind.

Further work on preparing reference samples of pulp which would retain their freeness values for a long time revealed that such samples prepared in sterilized distilled water showed constancy of freeness for six months.

A comparative study was undertaken of two types of fibre classifier, one of which originated at the Institute. These appliances separate a sample of pulp into fractions according to certain progressive ranges of fibre length. The initial results indicate that each type gives consistent results.

A thorough investigation of the Mullen tester, an instrument for measuring the bursting strength of paper, showed that the chief weaknesses were errors in the pressure gauges used and allowing air to be trapped in the tester. The results were being applied in preparing a standard method of making this test.

A relatively simple dead-weight mechanism, designed for calibrating gauges used with the tester, is being improved for use in paper mills.

Progress on the development of a photoelectric instrument for assessing the dirt spots in a sample of paper reached the stage where the instrument was considered sufficiently reliable to be manufactured for use as a piece of testing equipment for industry.

A complete new chemical pulping plant, consisting of three stainless steel digesters and auxiliary equipment, was installed in the mill for use in investigating methods of making chemical pulp. A start was made on installation of a precision machine shop capable of handling the increased needs of the laboratories and the mill.

In the interest of economy in logging and closer utilization of wood, a study was made of the use of portable metal chutes for bringing wood down steep slopes. A system of logging steep slopes by gravity cableways was examined in actual operation in Swiss mountain forests for the Institute. The observations confirmed previous conclusions that its introduction into Canada is desirable for conservation and economy.

Field work in the study of the skidding of wood by gravity from a suspended wire developed the method to the point of possible commercial application. Assistance was given to some companies in their field trials.

An analysis was made of present methods and equipment for constructing and maintaining woods roads for trucks, as practised by several companies, with the purpose of recommending improvements.

Portable strain gauges were studied for application in measuring strains in log booms, road bridges, and other forest construction work.

Further attention was given to the design and construction of pulpwood holding grounds, where large supplies of pulpwood are held within booms in suitable areas of waterways. Preservative treatment of booms was also studied.

Preliminary work was done towards establishing a uniform basis for classifying Canada's forests and for collecting information on growth and yield, so as to avoid undue duplication of effort.

In one field experiment, the cost of thinning overdense stands of balsam fir was determined.

An analysis of Canada's forest-fire situation resulted in the recommendation of a research program to find more rapid and dependable means of forest-fire suppression under difficult conditions.

Services and Lectures

Two new services were offered to the industry in connection with the use of the Mullen tester. Sets of pieces of aluminum foil can now be obtained for use as standards of bursting strength for checking a tester at a mill. Gauges used with these testers can be calibrated at the Institute on an apparatus which tests a gauge in use under working conditions.

Eight hundred and ninety-one calibrations of instruments and standard material, and 610 tests of samples of materials and products were carried out for industry.

A series of nine lectures on pulp and paper subjects was given at the University of British Columbia by specialists from the industry under auspices of the Institute.

Forest Products Laboratory, Vancouver

Additional accommodation and personnel were provided to cope with a rapidly expanding program of research.

Markets for forest products became more competitive, resulting in greater demands from industry for technical service and research, largely on production methods intended to reduce the wastage of raw materials, to increase efficiency of utilization, and to utilize species of minor importance.

Much time was given to service on special committees set up to study improved standards of manufacture and use. An Industry Committee, including representatives of seven major forest products industry groups, was set up to study the Laboratory's facilities for service to industry and to assist in co-ordinating the Laboratory program to the needs of industry.

Division of Timber Mechanics

The assembly of basic data on the physical and mechanical properties of western Canadian woods was continued. In this connection, one shipment each of western birch from Quesnel and second-growth Douglas fir from the lower Fraser Valley were tested in green condition. Tests of a shipment of mountain hemlock, air-dried, were completed, and shipment averages were recorded for three shipments of amabilis fir. A shipment of old-growth Douglas fir was obtained from near Quesnel to determine the effect of site on strength properties.

Although standard specifications for structural timber design to provide adequate factors of safety without wasteful use of material are desirable, the premises upon which such specifications must be based are not well understood. A great deal of detailed test data has been tabulated from tests of full-size

Douglas fir and western hemlock joists in five dimensions at the Vancouver Laboratory. Using this information as a basis for discussion, representatives of the Vancouver, Ottawa, and United States Forest Products Laboratories, meeting in Ottawa and Madison, Wisconsin, reached full agreement on the principle of basic stresses for all structural timbers common to Canada and the United States. Ultimately, from these stresses, the design of working stresses will follow, by applying a multiplying factor, to be determined from a study of structural grading rules and dependent upon the impairment in strength of the clear wood by the maximum defects permitted by the grades.

Investigation of the comparative specific gravities and mechanical strength properties of material from north, east, south, and west sides of eleven western species showed no material variation in average specific gravity. Similar results were obtained for the average strength factors of Douglas fir in both the green and air-dried conditions.

Towards meeting a demand for exact information on the comparative strength of poles from western Canadian species, based upon tests of full-size material, 100 pieces of western hemlock from the southern coastal area and a similar number of mountain type Douglas fir poles from near Merritt were stacked for air-seasoning prior to testing. One-half of each shipment is to be given creosote treatment prior to testing, in order to determine the effect of preservative treatment upon the strength of the wood.

These poles are included in records of three other studies of pole timber requirements. These other studies are: taper of poles and piling of western species and the effect upon volume; the changes in circumferential measurements in poles during seasoning and during preservative treatment; and the percentage of heartwood diameter to overall diameter. Pole and pile specifications call for a minimum circumferential measurement for poles, but do not specify under what conditions the measurements shall apply. The results of this study should provide the information. Results of the third study already indicate that a considerable percentage of piles will not comply with Canadian Standards Association specifications for untreated round timber piles.

Arrangements were completed for a survey of the problems facing the veneer and plywood industry. Data were obtained on the relation of dryer speeds and temperatures to the moisture content of the veneer at emergence from the dryer. Much attention was given to glue extenders and mixing and spreading techniques. A number of full-size sections, built-up plywood doors, and plywood sections meeting R.C.A.F. specifications, were investigated.

Staff members met with representatives of the Ottawa Laboratory, the United States Forest Products Laboratory, and all British Empire forest research laboratories maintaining a timber mechanics unit, at Ottawa and Madison, Wisconsin, to study current procedure in timber mechanics research with the object of co-ordinating such procedure in all laboratories.

More than 1,800 tests of mechanical strength and 2,500 tests of physical properties of wood samples were made for industry. Also, 250 custom tests were made on materials other than wood, since equipment for such testing is not locally available.

During the University sessions, about 750 engineering students were given instruction and demonstration in testing materials of construction. With installation of new facilities by the University, it is expected that this service by the Laboratory will no longer be required.

Division of Wood Utilization

Studies made at four sawmills in the interior of British Columbia to determine the quantity of logs not converted into lumber showed results similar to those from previous surveys, except that much less material was wasted. All mills but one were marketing unconverted material, or using it as boiler fuel.

Measurements at West Coast sawmills of a large volume of sawmill waste intended for use as pulpwood gave specific details of wood volume in stacked material and sling-loads, and showed that there is little relation between the number of pieces and the cubic volume per cord, that the weight varies considerably with the time the wood remains in the stack, and that the average bark content was about 10 per cent of the gross solid volume.

Analysis of test data derived from studies of lumber manufacturing methods at Interior and Coast sawmills led to some interesting conclusions. Cubic volumes for 16-foot Engelmann spruce logs were computed by the Smalian formula. The board-foot to cubic-foot ratio showed considerable variation from small to large diameter, using the B.C. Log Scale, but was practically constant when based on lumber recovery. Similar results were found for 16- and 22-foot Douglas fir logs at Coast mills. The results showed that circular saw mills will produce a higher profit than gang saw mills. The lower cost of operating the latter is more than offset by the higher value of the products of circular sawmills. It was also indicated that gang mill operation must be carefully planned to get the most out of the logs.

Field studies on six logging operations in coastal areas, designed to determine the volume and nature of logging waste and the methods of salvage logging were completed. Plots were also set up on twenty-five logged areas in nine Coast operations, from which the reports show the net cubic volume of waste per acre of saw-logs, pulpwood, and stump wood. Compilation of test data from various studies showed that if relogging had not been practised, about 50 per cent of the original volume would have been left as waste. On one operation, 49 per cent of the pieces left were 9 inches and over in diameter—equivalent to 81 per cent of the waste—while on a second, 34 per cent of the pieces were 9 inches and over—equivalent to 58 per cent of the waste. Field work was also initiated to determine the cause of breakage in logging. Studies so far completed indicate the heaviest loss from this cause occurs in western red cedar during extraction of large high-grade logs.

Studies on western hemlock and broadleaf maple to determine the comparative rate of moisture absorption by kiln-dried and air-seasoned material under storage conditions, showed that kiln-dried lumber does not absorb moisture to the same extent as the air-seasoned lumber, and that there is no difference in the rate of absorption of material kiln-dried at different temperatures.

Experimental kiln runs were made to establish drying schedules for white spruce from northern British Columbia and western larch from the southern interior. Test drying of samples of western red cedar, showing serious loss from collapse established a suitable schedule which would reduce the loss when certain low-floating types of logs are segregated for drying. Special tests also established suitable drying procedure for timbers imported from Chile. Runs were made in both the experimental and the commercial kiln to establish satisfactory drying schedules for western red cedar shingles to be dried under varying conditions.

Further co-operation was extended to the Provincial Forest Service in preparing, calibrating, and drying forest fire hazard sticks.

Division of Wood Preservation

Marked advance was made in equipping a laboratory for required studies on wood preservation problems.

Early studies of the experimental retort for conditioning wood before treatment have shown that it duplicates operating characteristics of full-sized retorts, which indicates that information obtained from this retort can be applied to commercial retorts. Tests have developed a method of control which permits regulation of the rate of boiling, in the boiling-under-vacuum process, and were being continued to clear up the cause of minor fluctuations in the rate.

Studies were in progress to determine whether it is possible to separate the oil fractions continuously as they are condensed, and an alternative condensing system was incorporated in the retort with this end in view.

In co-operation with the Alberta Forest Service a study was initiated to determine the durability of butt-treated lodgepole pine poles. Two hundred poles will be given butt treatment, after which they will be installed in telephone lines in Alberta. A complete service record will be kept of all poles included in the study.

Collaboration with the Ottawa Laboratory in recording the service life of Western Canadian wood products under conditions favouring decay, or when subject to attack by insects or marine borers was continued. Assistance was also extended in many cases where wood structures were found subject to such damage.

More than 100 wood samples and a number of fuel samples were identified for industrial firms or individuals. Several examinations were made of telephone poles, piling, and other items, to confirm identification, or to determine the cause of faults occurring during manufacture.

An investigation was carried out to identify the fungus causing a pink stain in lodgepole pine from Alberta. Other lots of this species from the Coast and from other areas of Alberta showing evidence of other fungus attack were also examined. Information was assembled on the effect of decay on the pulping qualities of western softwoods.

The problem of sap stain and mould development in certain western species, particularly where kiln-drying facilities are limited, has become serious now that market requirements have stiffened. Many proprietary compounds have been offered as preventives, but little comparative information is available as to their effectiveness. Three of the products tested on white pine, Douglas fir, and western hemlock which had been close-piled and sprayed with a spore suspension containing stain and mould fungi gave satisfactory results after four months. A survey was made in the fruit-growing region of the southern interior where the problem is serious, and plans were made to carry out service tests in that area during the summer of 1949. Meantime, accelerated toxicity tests were in progress to determine the toxic concentrations of various compounds, in order to eliminate those unsuitable for large-scale service tests.

Some success was attained with two groups of chemical reagents that were tried out to discover a colour test for delimiting the sapwood and heartwood of western hemlock and other woods showing no marked visual difference. The tests were extended to borings taken from living trees, at monthly intervals, in order to investigate the possible effect of seasonal influences on the efficacy of the indicators used.

Division of Wood Chemistry

Much of the work was of a preparatory nature, but a great deal of valuable information on the application of chemical research to waste utilization of western Canadian woods was acquired. Basic equipment and some specialized equipment was installed and preliminary studies were in progress on a number of promising subjects.

Extensive investigation was made of the tannin content of western hemlock bark and of means of removing salt from the tannin extract prepared from salt-water-floated bark. Tests show that this can be done by ion-exchange technique.

Results of analyses on Douglas fir bark to determine whether the tannin is concentrated in the phenolic powder fraction commonly obtained indicate that this fraction contains the highest percentage of tannin, but that the difference would not warrant separation of the fractions before tannin extraction.

Publications

News Letter	Forest Products Laboratory, Vancouver —(3 issues).
The Air Seasoning of Timber, Poles and Ties.	Mimeo V—104.
Basic Stresses for Wood.....	Mimeograph of a paper presented before the Pacific Northwest Section of the Forest Products Research Society.
A survey of Dry-Kilns in the Southern Coast Region of British Columbia.	Published in *Canada Lumberman*, Aug. 1, 1948, and *West Coast Lumberman*, August, 1949—also mimeographed.
Colorimetric Delimitation of Sapwood and Heartwood in Western Hemlock.	Progress Report, Project V-82 (for limited distribution).
A Study of the Absorption of Moisture by Kiln-Dried Broadleaf Maple as Compared with Matched Air-Dried Stock under British Columbia Coast Conditions.	Progress Report No. 4, Project V-2.
Wood Waste as a Source of Pulpwood on the Pacific Coast.	Mimeograph of a paper presented before the Canadian Pulp and Paper Association (for limited distribution).
Toxicity Tests of the Wood Preservative, Copper Naphthenate.	

Geological Survey of Canada

The Geological Survey of Canada systematically maps and reports on the geology of Canada, with particular reference to potential sources of minerals. It advises and assists prospectors and others engaged in mining development; acts as consultant to, and co-operates with, other Government agencies engaged in resources development or research; and issues reports and maps giving the results of its field investigations and office studies.

Three geologists specializing in coal were added to the staff, two of whom were assigned to stratigraphic and microscopic studies of the Sydney submarine coalfield, a project undertaken in co-operation with the Nova Scotia Department of Mines. Three specialists were appointed to the Palæontological Section, and one to operate X-ray diffraction equipment designed to facilitate the identification of minerals and the study of radioactive minerals in particular. A separate staff was organized to make investigations and to advise and assist those interested in radioactive minerals.

The 61 parties assigned to field work gave special attention to areas of economic interest throughout Canada including potential sources of base metals, gold, oil, and gas. Eight parties operated in Northwest Territories, 4 in Yukon, 14 in British Columbia, 7 in Alberta, 3 in Saskatchewan, 9 in Manitoba, 4 in Ontario, 4 in Quebec, 2 in New Brunswick, 2 in Nova Scotia, 1 in Prince Edward Island, and 3 in two or more provinces.

The unparalleled activity in the search for oil and gas, particularly in western Canada, was reflected in the 86,939 borings samples received for filing and study. Furthermore, the mounting volume of natural gas from wells in western Canada directed attention to the need for authoritative information in this field as a basis for economic development. To provide this information, the Chief of the Geological Survey and an engineer of the Bureau of Mines collaborated in a detailed study and appraisal of the gas reserves of western Canada.

Indicative of the sustained interest in the search for minerals, more than 7,000 mineral specimens were received for identification, and 2,119 collections of minerals and rocks containing 74,576 specimens were supplied to prospectors, educational institutions, and the public.

Eighty-two maps were published, of which 19 were standard geological, 24 preliminary geological, 35 topographical, 1 airborne magnetic series, and 1 geographical map. More than 195,800 reports and maps were distributed.

Geological Division

The staff of the new Geophysics Section was expanded to cope with the plotting of magnetic data acquired by use of the airborne magnetometer over large mineralized areas in western Quebec and eastern Ontario. Field and laboratory work was done on radioactive mineral occurrences, on analytical studies of specimens collected or sent in from many parts of the Dominion, and on apparatus useful for field identification and subsequent analyses of the rare-element minerals. Special attention was given to the discoveries and output of petroleum in the western Plains, in assessments of the huge reservoirs of gas in the western provinces, and in the compilation of map and statistical data on Canada's coal reserves.

The meeting of the International Union of Geodesy and Geophysics, held in Oslo, Norway, August 19 to 28, was attended by the Chief Geologist, who also attended subsequent meetings of the International Geological Congress at London, England. Late in the year the geologist in charge of the Vancouver office was official delegate to the Seventh Pacific Science Congress meetings in New Zealand.

Field work included a preliminary investigation of the Groundhog coalfield in northeastern British Columbia; a detailed survey of the Minto coalfield in New Brunswick; and commencement of detailed structural, stratigraphic, and petrographic studies of the Sydney coalfields of Nova Scotia. A survey of glacial geology and ground-water conditions was commenced in Prince Edward Island, and other such studies were continued in Ontario, Manitoba, and Alberta. Standard geological mapping on scales of either 1 or 4 miles to an inch was conducted in 33 areas across Canada. Detail mapping was continued in the gold-bearing greenstone belt at Yellowknife, Northwest Territories, and was undertaken at Giauque and Matthews Lakes north and northeast of Yellowknife respectively, where significant gold discoveries had been made. Commencement was also made in re-mapping in detail the productive silver-lead camps near Mayo in Yukon, and similar detailed mapping was continued on either side of the Quebec-Ontario boundary along the Larder Lake-Rouyn mineral belt. Subsurface stratigraphic studies were continued in the Lloydminster oil and gas field of Saskatchewan and Alberta, and other stratigraphic investigations, supplemented by palæontological collections, were made in various parts of British Columbia and Alberta to assist geological mapping in potentially metalliferous, coal-bearing, or oil-productive areas. Assistance was given to various engineering projects of interest to industry or agriculture.

In Ottawa, visiting oil geologists employed in Canada were provided temporary office accommodation and the records and facilties of the Palæontological and Borings Sections were placed at their disposal. To a lesser extent these and other services of the division were made available to visiting scientists from Canada and other countries.

The regrettable death of J. S. Stewart, Chief of the Ground Water and Borings Section, on October 28, 1948, removed one of the older members of the staff, best known for his contributions on the geology of the western Plains and Foothills and for his more recent work in the Fort Norman oil field and other parts of Mackenzie Basin.

Field Work

General

G. S. Hume continued supervisory work in the oil and gas fields of western Canada, and maintained close touch with industrial developments there. He visited geological parties in various parts of Canada where active mining is in progress.

T. L. Tanton examined hematite iron deposits along the crest of Iron Range Mountain near Kitchener, British Columbia. He continued field work at Steep Rock iron mine and neighbouring properties and later examined various occurrences of iron and other deposits in the vicinity of Port Arthur and Sault Ste. Marie, Ontario, and in Pontiac county, Quebec. Results obtained contribute to the use of geophysical methods in the exploration of iron deposits, and on the lithological and mineralogical character of iron ores as represented by samples and reports received from many property owners.

A. H. Lang was assigned to the field investigation of Canadian uranium deposits. He spent several weeks on the Eldorado properties at Great Bear Lake and Lake Athabasca to acquire a background for examinations of privately-owned occurrences. Subsequently he examined 29 such occurrences in various parts of Northwest Territories, Saskatchewan, and Ontario. At the invitation of the United States Atomic Energy Commission and the United States Geological Survey, he visited several United States uranium deposits, treatment plants, and laboratories.

Northwest Territories

M. Feniak examined 14 mining properties in widely separate areas where mining or active development of orebodies containing gold, uranium, or base metals was in progress. He was appointed as officer for the Lands and Development Services Branch of the Department to give "field supervision to the observance of the Regulations for the disposal of Petroleum and Natural Gas Rights in the Northwest Territories and Yukon Territory".

C. S. Lord commenced geological mapping of the Aylmer Lake area (longitude 108° to 110°, latitude 64° to 65°) about 250 miles northeast of Yellowknife. The area is essentially unprospected, but geological conditions are favourable for gold-bearing veins and for the occurrence of a variety of strategic minerals in pegmatite dykes.

M. L. Miller commenced geological mapping of the Carp Lakes area (longitude 112° to 114°, latitude 63° to 64°). Evidence of prospecting was seen everywhere except in the granite areas, and significant gold-bearing deposits have been discovered near Giauque Lake near the southwest boundary of the area.

D. H. Yardley commenced and completed geological mapping of the Wecho River (E/2) area (longitude 114° to 115°, latitude 63° to 64°), which lies between the Yellowknife and Indin Lake gold areas and is believed to be traversed by a zone of faults connecting these areas.

J. F. Henderson and I. C. Brown continued detailed mapping of the Yellowknife Bay greenstone belt commenced in 1946. This work is on a scale of 1 inch to 500 feet.

L. P. Tremblay commenced detailed geological mapping of an area about 11 miles long and 4 miles wide in the vicinity of Giauque Lake at longitude 114° and north of latitude 63°. He examined the Discovery Yellowknife, La Salle Yellowknife, Typhoon Yellowknife, and Neo-Yellowknife gold prospects, on all of which some trenching and drilling had been done.

Y. O. Fortier commenced and completed geological mapping of the east half of the Indin Lake area (longitude 114° to 115°, latitude 64° to 65°). Much of the area is underlain by granitic rocks, but along the western boundary volcanic and sedimentary rocks of the ancient Yellowknife group are exposed, and a variety of sulphide minerals observed along some contacts.

R. E. Folinsbee commenced and completed detailed geological mapping of an area about 6 miles wide by 16 miles long in the vicinity of Matthews Lake within the Lac de Gras 4-mile area. Gold-bearing quartz veins and replacement bodies have been discovered within this limited area.

Yukon

H. S. Bostock nearly completed geological mapping of the McQuesten area (longitude 136° to 138°, latitude 63° to 64°). The work has revealed a large, potentially metalliferous area in the northern part, where some interesting occurrences of lead and zinc minerals were discovered. He gave special attention to a study of the superficial deposits in this and the adjoining Ogilvie map-area to the west.

E. D. Kindle continued geological mapping in the Dezadeash area (longitude 136° to 138°, latitude 60° to 61°) commenced in 1946. During the field season a promising new coal-bearing zone was discovered in strata of Jurassic age. Discoveries were also made of copper minerals in a favourable prospecting belt 18 miles long.

J. O. Wheeler resumed work in the Whitehorse area (longitude 134° to 136°, latitude 60° to 61°). The project involves the re-mapping on a modern, contoured, topographic base, of one of the more accessible and economically significant parts of the Yukon in which a variety of ores and mineral deposits has been discovered, and on which much exploratory and development work has been done.

K. C. McTaggart commenced detailed geological mapping in Galena Hill-Keno Hill area, Mayo district. This is a well-known silver-lead camp in which recent explorations have been most encouraging.

British Columbia

W. E. Cockfield maintained close touch with the mining industry of the Province from his headquarters in the Vancouver office. He carried out various assignments in the field, chiefly in connection with engineering projects in the Okanagan, Similkameen, and Kootenay districts.

E. F. Roots completed geological mapping of the Aiken Lake area (longitude 125° to 126°, latitude 56° to 57°) commenced in 1945. The area is relatively inaccessible and undeveloped, but has provided a great variety of significant mineral discoveries. Several new discoveries were made in the course of field work, including deposits of potassium nitrate.

S. Duffell continued geological mapping of the Whitesail Lake area (longitude 126° to 128°, latitude 53° to 54°) commenced in 1947. The area occupies part of the eastern flank of the Coast Mountains and contains mineral and perhaps coal deposits. The mapping is expected to provide information relative to the intrusions responsible for mineralization, as well as on the mineral deposits themselves.

J. W. Hoadley continued geological mapping of the Zeballos area (longitude 126° 30′ to 127°; latitude 49° 45′ to 50°), Vancouver Island, commenced in 1947. The area lies in a mineralized region adjoining that of the Zeballos gold-mining camp and the work is expected to provide useful information on the source and character of the mineral deposits.

A. F. Buckham commenced geological examination of the Groundhog coalfield in northwestern British Columbia near the headwaters of Skeena River. The coalfield is difficult of access, has a large area, and is underlain mainly by a thick succession of sedimentary formations of Cretaceous and perhaps Jurassic age, in the upper part of which the principal coal measures occur. Preliminary investigation and sampling seem to indicate that the coal is anthracite, high in ash, and extremely friable.

J. E. Armstrong commenced systematic geological mapping of a series of four 1-mile map-areas in the vicinity of Vancouver (longitude 122° 30′ to 123° 30′, latitude 49° to 49° 30′). These areas straddle the lower Fraser River Valley and include the most densely populated and industrialized part of the

Province as well as important agricultural sections. The Coast Mountains north of the river contain mineral deposits of some interest, and the rock formations and unconsolidated glacial deposits of these areas are a convenient source of construction materials.

J. L. Usher completed field work on the stratigraphy and palæontology of the Upper Cretaceous coal-bearing series of southeastern Vancouver Island and nearby islands. He discovered many new fossil localities and made collections, which when studied should assist materially in the structural interpretation of the coal measures and in the more precise correlation of Upper Cretaceous coal-bearing rocks elsewhere in western Canada.

A. G. Jones commenced geological mapping of the Revelstoke area (longitude 118° to 119°, latitude 50° to 51°). Geologically, the area supplies a vital link across a wide belt of highly granitized rocks in the historical and structural relations of formations in the eastern and western parts of southern British Columbia.

V. J. Okulitch examined a thick section of unfossiliferous strata exposed in the Selkirk Mountains along the main line of the Canadian Pacific Railway between Albert Canyon and Beavermouth Valley.

H. W. Little commenced geological mapping of the west half of the Nelson area (longitude 117° to 118°, latitude 49° to 50°). The area is one of the most productive in the Province, including a great number of mining properties around such centres as Sandon, Slocan, Nelson, Ymir, Salmo, Sheep Creek, and Rossland. The work will bring information on mining activities up to date, and will revise and correlate the work of earlier geologists in different parts of the area.

A. L. McAllister completed geological mapping of the Ymir area (longitude 117° to 117°15′, latitude 49°15′ to 49°30′) commenced in 1947. The field work has involved a considerable revision of the geology, and should assist in the exploration and development of the mining properties.

E. Hall continued his services throughout the year at Columbia River dam sites, examining and correlating drill cuttings and cores for the Dominion Water and Power Bureau.

W. A. Bell collected palæontological data in southwestern British Columbia from the coal measures of the Princeton and Nicola coalfields. This work will assist in the correlation of the coal-bearing strata of the separate productive basins and will throw additional light on the age and sequence of the Tertiary formations in this and other parts of the Province.

C. M. Sternberg collected Triassic fossil fish from the Wapiti Lake district, and Cretaceous plants from Pine River at East Pine, northeastern British Columbia.

Alberta

E. J. W. Irish completed geological mapping of the Â la Peche area (longitude 118°45′ to 119°, latitude 53°45′ to 54°) commenced in 1947. Interest in the area has been centred on the Muskeg anticline on which a test well was being drilled. He mapped this and other possible ore structures and gained information on the extent of the Lower Cretaceous (Luscar) coal measures within the map-area. The largest seam observed was about 10 feet thick.

R. Thorsteinson commenced geological mapping of the Grande Cache area (longitude 119° to 119°15′, latitude 53°45′ to 54°) in the Foothills belt of west-central Alberta. He observed 17 coal seams within a stratigraphic interval of 325 to 846 feet below the top of the Lower Cretaceous Blairmore group. Fourteen of these are between 2 and 5 feet thick; the others are 8, 11, and 23 feet thick respectively.

A. M. Stalker continued investigations of ground-water supplies and Pleistocene geology commenced in 1946 in the vicinity of Red Deer, in south-central Alberta.

R. J. W. Douglas completed geological mapping of the Mount Head area (longitude 114°30′ to 114°45′, latitude 50°15′ to 50°30′) commenced in 1947. The area, which lies in the Foothills belt of southern Alberta, contains an oil structure favourable for further testing, and significant coal measures of Kootenay age.

E. P. Williams completed geological mapping of the Cardston area (longitude 113°15′ to 113°30′, latitude 49° to 49°15′) commenced in 1947. The area lies in the Foothills belt at the International Boundary and is being prospected for favourable oil structures. It contains some coal in the Upper Cretaceous St. Mary River formation and sedimentary magnetite deposits in basal Belly River strata.

R. de Wit examined sections of Devono-Carboniferous rocks, and well cores at Calgary, preparatory to commencing geological mapping of the Wabanum Lake area (longitude 114° to 115°, latitude 53° to 54°) west of Edmonton. These studies should facilitate subsurface correlation of the late Palæozoic strata in productive oil fields of the western Plains and assist in the discovery of other such fields.

Alberta and Saskatchewan

R. T. D. Wickenden continued to study drill cores and other well samples from the Lloydminster field in order to interpret the subsurface stratigraphy and its relation to the occurrence of petroleum and natural gas. A preliminary report was issued on the results of investigations to date. His work has indicated possibilities of new oil zones and probable extension of the field.

Saskatchewan

A. M. Christie completed geological mapping of the adjoining Martin Lake area (longitude 108°15′ to 108°45′, latitude 59°30′ to 59°45′) and Goldfields area (longitude 108°15′ to 108°45′, latitude 59°15′ to 59°30′) commenced in 1947. These areas, on the north shore of Lake Athabasca, are of principal interest because of the discovery of radioactive mineral occurrences.

G. E. P. Eastwood completed geological mapping of the Snake Rapids area (longitude 102°30′ to 102°45′, latitude 54°30′ to 54°45′) commenced in 1947. He saw evidence of mineralization in many parts of the area.

Manitoba

J. M. Harrison supervised several parties operating in Precambrian areas of the west-central part of the Province and in an adjacent area in Saskatchewan. He also examined beryl-bearing pegmatite dykes in southeastern Manitoba, and made a reconnaissance flight from Brochet, Manitoba, north to near South Henik Lake in bordering regions of the Northwest Territories.

D. S. Robertson continued geological mapping in the Batty Lake area (longitude 100°30′ to 101°, latitude 55° to 55°15′) commenced in 1947. He identified a good zone for prospecting and traced it nearly continuously across the area.

M. J. Frarey completed geological mapping of the Crowduck Bay area (longitude 99°30′ to 99°45′, latitude 54°40′ to 55°) commenced in 1947, and commenced and completed geological mapping of the Collins Point area (longitude 101°15′ to 101°30′, latitude 55° to 55°15′). The Crowduck Bay area lies on the eastern extension of the Herb Lake-Snow Lake gold region, includes one gold property, lithium (spodume) deposits, and several scattered showings of gold, copper, lead, and nickel minerals. The Collins Point area lies west of Sherridon, in the Kississing Lake district, and is underlain mainly by Kisseynew gneisses.

J. O. Kalliokoski commenced geological mapping of the Weldon Bay area (longitude 101°15′ to 101°30′, latitude 54°45′ to 55°) northeast of Flin Flon and south of Sherridon. He found evidence of sulphide mineralization around Naosap Lake and on Sewap Lake.

E. B. Owen commenced and completed geological mapping of the Churchill area (longitude 94° to 94°30′, latitude 58°30′ to 58°50′) at the mouth of Churchill River. He gave special attention to the glacial deposits and to perma-frost conditions.

G. M. Wright commenced and completed a geological reconnaissance of the Uhlman Lake area (longitude 98° to 100°, latitude 56° to 57°). Favourable ground for prospecting lies mainly in the west half of the area from Rat Lake north. The south part of the area includes many pegmatite dykes, in some of which a few crystals of beryl were found.

N. R. Gadd commenced and completed a geological reconnaissance of the Brochet area (longitude 100° to 102°, latitude 57° to 58°). Most of the area is underlain by granite and granitized sedimetary rocks. There is evidence of mineralization in a northwest arm of Brightsand Lake.

J. A. Elson commenced investigations of Pleistocene geology and groundwater supply in south-central Manitoba and by the end of the season had completed the work in 36 townships.

E. C. Halstead continued investigations of Pleistocene geology and groundwater supply in southwestern Manitoba, commenced in 1947. He completed the work in two blocks of 16 townships each and partly completed the work in a third.

Ontario

J. F. Caley continued geological mapping of the Palæozoic formations in southern Ontario east of Lake Simcoe. He completed the mapping in the Brechin area (longitude 79° to 79°15′, latitude 44°30′ to 44°45′), and commenced and completed mapping in the adjoining Kirkfield area (longitude 78°45′ to 79°, latitude 44°30′ to 44°45′). This work is expected to assist the detailed logging of well samples in potential oil and gas fields of southwestern Ontario where the same formations are buried beneath the surface. He obtained records for about 400 new wells drilled between October 1947 and October 1948. He visited localities in Bruce Peninsula to check structural data previously obtained, and investigated oil drilling on Manitoulin Island.

R. E. Deane mapped the Pleistocene deposits of, and collected the groundwater data for, an area of some 680 square miles of southern Ontario, comprising seven townships in York, Simcoe, and Ontario counties. The work is designed to assist agricultural and constructional activities.

J. B. Currie completed detailed geological mapping of Ossian township in northeastern Ontario adjoining the Quebec boundary. The township lies along or near the Larder Lake-Rouyn gold belt, and includes promising gold prospects occurring as mineralized shear zones in altered volcanic rocks.

G. P. Crombie commenced geological investigation and mapping within a block of nine 15 by 30-minute map-areas in southeastern Ontario between longitudes 75°30′ and 77° and latitudes 44°45′ and 45°30′. These are areas within which data had been compiled from the results of an airborne magnetic survey, and a principal purpose of the ground investigations was to correlate the magnetic anomalies with the geology as known or inferred from outcrop information. This information has proved sufficient to date to account for the general magnetic pattern in the Precambrian rocks of the Arnprior, Carleton Place, and Perth sheets (longitude 76° to 76°30′, latitude 44°45′ to 45°30′).

Quebec

H. C. Cooke completed systematic geological mapping and revision of the geology in the Eastern Townships mineral belt from southern Megantic and Arthabasca counties in the north to the International Boundary on either side of Lake Memphramagog on the south. The work commenced in 1943 has

encountered many difficult structural, stratigraphic, and lithological problems in a region where copper, gold, pyrites, and chromite have been mined, and where building stone and a variety of constructional materials are produced.

C. H. Stockwell and K. R. Dawson continued detailed geological mapping in Beauchastel and Dasserat townships in the western extension of the Rouyn-Malartic mineral belt, along the Cadillac break, and, presumably, on the eastern extension of the Larder Lake break of Ontario. Many gold deposits also occur in fault zones north of these main breaks, and mapping has indicated extensions of some of these and has revealed others where none had been suspected.

A. S. MacLaren continued revision of geological 1-mile map-areas in northwestern Quebec along or near the Rouyn-Malartic mineral belt.

New Brunswick

G. S. MacKenzie continued systematic geological 1-mile mapping in southern New Brunswick in the Bay of Fundy region. His work was essentially completed in the Hampstead area (longitude 66° to 66°30′, latitude 45°30′ to 45°45′) and he checked features with those of adjoining areas.

J. E. Muller commenced and completed a geological revision of the adjoining west half of the Chipman and east half of the Minto areas (longitude 65°45′ to 66°15′, latitude 46° to 46°15′). The work involved a detailed stratigraphic study of the Minto coal basin.

Nova Scotia

L. J. Weeks completed systematic geological mapping of a group of six, 15-minute, 1-mile areas in Cape Breton Island (longitude 59°45′ to 60°45′, latitude 45°30′ to 46°). The work was commenced in 1944 to determine areas in which extensions of the Stirling zinc-lead-copper orebody might be found. The areas also include replacement deposits of manganese and iron minerals, some coal, and concentrations of slightly radioactive black sand.

T. B. Haites commenced a detailed structural and stratigraphic study of the Sydney coalfields.

Prince Edward Island

E. B. Owen commenced systematic investigation of Pleistocene deposits and ground-water conditions. He completed geological mapping in the O'Leary area (longitude 64° to 64°30′, latitude 46°30′ to 46°45′) and examined gravel and silica sand deposits elsewhere on the island.

Office and Laboratory Work

Many special reports and maps, based largely on field examinations, were prepared for use of Government departments, national or international committees, and mining companies.

The paper series of mimeographed reports and preliminary blue-line maps continued to provide advance information on the results of field investigations. Among these were 13 maps representing compilations of ground-magnetic surveys in townships of northwestern Quebec along the Rouyn-Malartic gold belt. Another, comprising a report and printed map, dealt with a reconnaissance survey by aircraft of a large area in the western Arctic regions of Canada. Another was a preliminary account of uranium prospecting in Canada, and still another was descriptive of the statigraphy and structure of the Lloydminster oil and gas field of Saskatchewan and Alberta. Eleven reports and 38 maps were prepared for publication in this series.

The series of mimeographed water-supply papers provide information on ground-water conditions and Pleistocene geology in different parts of Canada.

Early in 1948 a special mimeographed report on "Natural Gas Reserves of Prairie Provinces" was issued. The report contains 39 blue-line print maps, many of them hand coloured.

The X-ray diffraction laboratory, equipped with the latest Philips basic diffraction unit, four Chesley type powder cameras, a Weissenberg goniometer, and ancillary equipment, was used principally in a study of pitchblende and uraninite.

Spectroscopic Work

Twenty-eight reports were issued on 110 samples received.

Radioactivity Investigations

Following the removal early in 1948 of Government restrictions on private prospecting for, and private development of radioactive mineral deposits, the Chief of the Geological Survey of Canada was made the agent of the Atomic Energy Control Board. It was agreed that the Geological Survey would encourage in every way possible prospecting for uranium deposits.

A radioactivity group was organized to deal with expected exceptional demands that would follow these commitments. A Geiger-Mueller counter laboratory and the necessary crushing and grinding machinery were installed.

In May, a great increase in the number of samples received for radioactivity tests became apparent, and the number tested during the year was 4,285.

In the late autumn and winter, when fewer samples were received, the group tested samples of all ores and products of Canadian mines for radioactivity and, spectrographically, for all elements present. More than a million classified samples of rock cuttings from oil, gas, or water wells, held by the Ground Water and Borings Section for reference purposes were tested.

Palæontological Section

Reports were made on 34 fossil collections submitted for identification and determination of the geological age of the rock formations containing them.

J. L. Usher completed field studies dealing with the age and succession of the coal-bearing strata of Vancouver Island, and W. A. Bell gathered fossil evidence for the age of Tertiary coal-bearing deposits in southern British Columbia.

In view of the increasing importance of oil-bearing formations in western Canada, the staff of the Section was enlarged to make thorough studies of the fossil fauna of these formations.

The Chief of the Section reported on Mesozoic and Tertiary plant collections from Dezadeash area, Yukon; from Bowron River, Aiken Lake, Fernie, and Vancouver areas, and from the Groundhog coalfield, British Columbia; and from À la Peche, Grande Cache, and Cardston areas and the southwestern Foothills, Alberta. He also reported on plant and invertebrate collections from Carboniferous formations in the Sackville area, New Brunswick, and the Loch Lomond area, Nova Scotia.

Senior geologists of the Section reported on Mesozoic invertebrate collections from the Whitehorse area, Yukon; the Zeballos and Whitesail Lake areas of British Columbia; Ellesmere Island, Arctic Archipelago; the Dezadeash area, Yukon; and the Yalekom River, Lytton, Coquihalla River, and Slocan areas in British Columbia.

They also reported on Palæozoic invertebrate collections from Bathurst Island, Arctic Archipelago; northern British Columbia; and the Moon Creek, Jasper Park, Banff, and Horse River areas of Alberta; and on a Silurian collec-

tion from Cornwallis Island, Upper Cretaceous invertebrates from Cowichan Valley, Vancouver Island; and a Carboniferous collection from the Fernie area, British Columbia.

The Section is indebted to Professor W. F. Whittard of the University of Bristol for donation of a suite of 79 specimens of fossils from the classic section of Lower Carboniferous rocks in the Bristol area, England. A second valuable addition to the Survey collections comprises duplicates of type specimens from Baffin Island, donated by Dr. A. K. Miller of the University of Iowa. Twenty-five specimens of fossil plants from the Kootenay formation of the Fernie area, British Columbia, were donated by the Research Council of Alberta, and in return 60 species of fossil plants from the coal measures of eastern Canada were presented to the University of Alberta.

Mineralogical Section

Seven thousand specimens of rocks and minerals were submitted from all parts of Canada for identification, and 1,000 reports were returned on their commercial possibilities. In addition, more than 500 visitors were supplied with verbal reports.

There were 2,119 collections containing 74,576 specimens distributed throughout Canada, an increase of 252 collections and 6,850 specimens over the previous year. The distribution, by collections and specimens respectively, was: British Columbia and Northwest Territories, 346 and 13,116; Alberta, 332 and 11,074; Saskatchewan, 105 and 3,467; Manitoba, 114 and 3,521; Ontario, 476 and 16,000; Quebec, 634 and 23,475; Maritime Provinces, 106 and 3,741; and Foreign 6 and 182.

Substantial additions were made to the mineral collection of the Geological Survey of Canada, including; azurite, chalcopyrite, bornite, chalcotrichite in calcite on copper, aurichalcite, stromeyerite, massive cuprite, malachite in calcite, velvet malachite, aragonite, native copper crystals, and calcocite from Bisbee, Arizona; galena, mottramite, ferrimolybdite on wulfenite, willemite crystals on wulfenite, linarite, dioptase, eodemite, cerusite, descloizite, diaboleite, and wulfenite from the Mammoth Mine, Tiger, Arizona; dogtooth calcite crystals from Texas; staurolite from Taos, New Mexico; chalcedony stalactite from Bloody Basin, Arizona; vanadinite from Globe, Arizona; obsidian bombs in perlite from Superior, Arizona; shattuckite from Ajo, Arizona; andradite garnets from Stanley Peak, Arizona; velvet malachite and white calcite and azurite and malachite from Tonopah Belmont, Vulture district, Nevada; pyrope garnets from Navajo county, Arizona; polished agate from Cave Creek, Arizona; turquoise from Nevada; geode from Burns, Oregon; and chrysocolla with quartz crystals from Misma, Arizona.

Ground Water and Borings Section

The work includes the collection of borings samples and the filing of records dealing with the occurrence of oil, gas, and ground water throughout Canada. Samples now available for study total 1,200,576 of which 86,939 were received and 85,718 were prepared during the past year.

The number of drill samples received may be subdivided as follows: British Columbia, 144 samples from 5 wells: Alberta, 74,743 samples from 205 wells; Saskatchewan, 130 samples from 2 wells; Ontario, 9,598 samples from 40 wells; Quebec, 1,183 samples from 6 wells; and New Brunswick, 1,141 samples from 3 wells.

Samples from British Columbia came from one deep well and several shallow water wells. Most of the Alberta samples were from development wells in known oil and gas fields in the Edmonton area. However, some were received from unproven territory, notably the Northern Foothills Agreement Muskeg

No. 1 well, and from deep tests in north-central Alberta. The samples from Saskatchewan were from the Lloydminster area. Ontario samples came from previously discovered oil and gas fields, with the exception of those from two wells drilled on Manitoulin Island. Quebec samples were from wells in Gaspé county and the St. John Petroleum No. 1 well at St. Hubert. Samples from New Brunswick represent deep tests in Albert and Kings counties.

Acknowledgments are due to the following persons and organizations through whose co-operation samples were received: the Petroleum and Natural Gas Conservation Board, Calgary, for Alberta well samples; W. J. Bichan, Director of Mineral Resources and Industrial Development, Regina, for those received from Saskatchewan; R. B. Harkness, Natural Gas Commissioner for Ontario, Toronto, for samples from that Province; Paul Payette, Gaspe Oil Ventures, Limited, Montreal, for Gaspé well samples; R. A. Sibbitt for samples from the St. Hubert, Quebec, well; and Shell Oil Company for samples from its wells in New Brunswick.

Acknowledgment is made to officials of the Petroleum and Natural Gas Conservation Board for periodical and interim reports, maps, and electrologs on Alberta drilling; to F. H. Edmunds, University of Saskatchewan, Saskatoon, for logs of oil wells, test holes, and shot holes drilled in that Province; to the Saskatchewan Department of Natural Resources and Industrial Development for monthly reports on Saskatchewan oil and gas activity; to Paul Payette for statements concerning Gaspé drilling progress; and to I. W. Jones, Geological Surveys Branch, Department of Mines, Quebec, for logs of Quebec wells.

Services were extended to geologists of Imperial Oil Limited, the Shell Oil Company, Stanolind Oil and Gas Company, Magnolia Petroleum Company, and British American Oil Company, who collected records and examined well samples available for inspection. Interdepartmental services were rendered to the Departments of Agriculture and Transport, Ottawa.

Coal Section

This Section is primarily concerned with field-mapping, office studies, and geological laboratory investigations relating to Canada's coal resources and geological problems connected with coal mining development in its various coalfields. New projects undertaken in the Maritime Provinces required an addition of three geological coal specialists to the staff. Two of these geologists were assigned to stratigraphic and microscopic studies of the Sydney submarine coalfield, Nova Scotia, and one to geological mapping of the Minto coalfield of New Brunswick.

The Nova Scotia investigation is a co-operative research project in which the Nova Scotia Department of Mines undertook to provide office and draughting roof accommodation at Sydney, and in co-operation with the Nova Scotia Research Foundation, to equip, maintain, and service an up-to-date geological research laboratory. The Geological Survey of Canada agreed to allocate the necessary scientific, technical, and clerical staff to a long-term detailed stratigraphic and microscopic study of the Sydney submarine coal deposits, which constitute the main coal reserves of the Province.

The third coal specialist geologically mapped the Minto-Chipman area of New Brunswick, and made a detailed investigation of its coal deposits. Upon completion of this work, he obtained at Springhill, N.S., supplementary stratigraphic and structural data required for the construction of a transparent sectional model of the coal deposits to serve the operators as a guide in future prospecting and mining development at these collieries.

Geophysics Section

The staff of this Section was increased from six to twelve, and the following units were established to deal with the various phases of the work: field work with airborne magnetometer; compilation and plotting; field work on ground surveys; and research and technical service.

Airborne magnetometer surveys totalling 15,100 square miles were made in Quebec and Ontario as follows: longitude 76°30′ to 77°, latitude 44°45′ to 45°30′ (1,268 square miles); longitude 76°30′ to 80°, latitude 48° to 49° (12,382 square miles); and longitude 77°30′ to 78°, latitude 44°25′ to 45°30′ (1,450 square miles). The last area was surveyed by Aero Service Corporation of Philadelphia under supervision of the Section and on behalf of the Ontario Department of Mines. Plotting and compilation of the field data are being done by the Section.

A ground magnetic and geological reconnaissance was made over an area (longitude 76° to 76°30′, latitude 44°45′ to 45°30′) that had been surveyed the previous year by the airborne magnetometer.

The research and technical unit developed a new light weight field Geiger counter.

British Columbia Office

A total of 4,507 visitors registered at the office, and many additional inquiries were handled by mail and telephone. There were 5,395 reports and 4,039 separate maps issued in response to requests from the public. Determinations were also made of a large number of rock and mineral specimens.

Yellowknife Office

Located at Yellowknife, Northwest Territories, the office is serviced jointly by a Resident Geologist for Geological Survey and by representatives of the Lands and Development Services Branch of the Department. During this first year of the service an estimated 1,100 persons visited the office for advice or assistance relative to mining properties or prospecting.

Geological Mapping Division

Maps Published

Publication Number	Title	Remarks
	YUKON AND NORTHWEST TERRITORIES	
847A	Arctic Red River, South Sheet (reprint); 1 inch to 4 miles..	Topography.*
	NORTHWEST TERRITORIES	
709A	Yellowknife Bay, District of Mackenzie (reprint); 1 inch to 1 mile.....	Geology.*
730A	Carp Lakes, District of Mackenzie (reprint); 1 inch to 4 miles.....	Topography.*
846A	Ontaratue River, District of Mackenzie (reprint); 1 inch to 4 miles.....	Topography.*
848A	Camsell Bend, District of Mackenzie (reprint); 1 inch to 4 miles.....	Topography.*
958A	Buckham Lake, District of Mackenzie; 1 inch to 1 mile....	Topography.*
959A	Hearne Lake; District of Mackenzie; 1 inch to 1 mile.....	Topography.*

Maps Published—Continued

Publication Number	Title	Remarks
977A	Lac de Gras, District of Mackenzie; 1 inch to 4 miles	Geology.*
48-10A	Ranji Lake, District of Mackenzie; 1 inch to ½ mile	Preliminary geological map. Paper 48-10.
48-17A	Yellowknife (two sheets) District of Mackenzie; 1 inch to 500 feet	Preliminary geological map. Paper 48-17.
48-19A	Camsell River, District of Mackenzie; 1 inch to 2 miles	Preliminary geological map. Paper 48-19.
48-20	Chalco Lake, District of Mackenzie; 1 inch to ½ mile	Preliminary geological map. Paper 48-20.
48-23	Flights in 1947 over the region of the North Magnetic Pole; 1 inch to 37½ miles	Geographical map. Paper 48-23
49-2	Aylmer Lake, District of Mackenzie; 1 inch to 2 miles	Preliminary geological map. Paper 49-2.
	BRITISH COLUMBIA	
237A	Big Bend Area, Columbia River (reprint); 1 inch to 4 miles	Geology.*
422A	Hope Sheet (West half) Yale and New Westminster Districts (reprint); 1 inch to 4 miles	Topography.*
931A	Taku River; 1 inch to 2 miles	Geology. For Memoir 248 *
932A	Geological Map of British Columbia; 1 inch to 20 miles (two sheets)	Geology.*
955A	Nelson; 1 inch to 1 mile	Topography.*
971A	Smithers-Fort St. James; 1 inch to 8 miles	Geology.*
48-4A	Salmon Arm, Kamloops and Osoyoos Districts; 1 inch to 2 miles	Preliminary geological map. Paper 48-4.
48-5A	Aiken Lake, Cassiar District; 1 inch to 2 miles	Preliminary geological and mineral deposits map. Paper 48-5.
	ALBERTA	
934A	Stimson Creek, West of Fifth Meridian; 1 inch to 1 mile	Geology.*
940A	Grande Prairie, West of Sixth Meridian; 1 inch to 2 miles	Topography.*
943A	High Prairie, West of Fifth Meridian; 1 inch to 2 miles	Topography.*
944A	Beaverlodge, West of Sixth Meridian; 1 inch to 2 miles	Topography.*
946A	Pierre Greys Lakes, West of Sixth Meridian; 1 inch to 1 mile	Topography.*
948A	McLennan, West of Fifth Meridian; 1 inch to 2 miles	Topography.*
949A	Blueberry Mountain, West of Sixth Meridian; 1 inch to 2 miles	Topography.*
954A	Rycroft, West of Sixth Meridian; 1 inch to 2 miles	Topography.*
956A	Sturgeon Lake, West of Fifth Meridian; 1 inch to 2 miles	Topography.*
968A	Moon Creek, West of Sixth Meridian; 1 inch to 1 mile	Geology.*
981A	Langford Creek, West of Fifth Meridian; 1 inch to 1 mile	Geology. For Memoir and *.
982A	Callum Creek, West of Fifth Meridian; 1 inch to 1 mile	Geology.*
48-7	Pierre Greys Lakes, west of Sixth Meridian; 1 inch to ½ mile	Preliminary geological map. Paper 48-7.

Maps Published—Continued

Publication Number	Title	Remarks
	ALBERTA AND SASKATCHEWAN	
48-21A	The Lower Cretaceous of the Lloydminster oil and gas area; 1 inch to 1 mile	Preliminary geological map and figure. Paper 48-21A.
	SASKATCHEWAN	
933A	Geological map of Southern Saskatchewan; 1 inch to 12 miles	Geology.*
941A	Mistatim, West of Second Meridian; 1 inch to 2 miles	Topography.*
942A	Arborfield, West of Second Meridian; 1 inch to 2 miles	Topography.*
952A	Pasquia, West of Second Meridian; 1 inch to 2 miles	Topography.*
48-18	Surface Deposits, Southern Saskatchewan (two sheets); 1 inch to 6 miles	Preliminary geological maps. Paper 48-18.
	SASKATCHEWAN-MANITOBA	
970A	Kississing; 1 inch to 4 miles	Geology.*
	MANITOBA	
929A	File Lake, West of Principal Meridian; 1 inch to 1 mile	Geology. For Memoir and *.
48-8	Nokomis Lake; 1 inch to ½ mile	Preliminary geological map. Paper 48-8.
48-22	Crowduck Bay; 1 inch to ½ mile	Preliminary geological map. Paper 48-22.
	ONTARIO	
244A	Panache Sheet, Sudbury and Manitoulin Districts (reprint); 1 inch to 1 mile	Topography.*
247A	Delamere Sheet, Sudbury and Parry Sound Districts (reprint); 1 inch to 1 mile	Topography.*
469A	Haliburton Sheet, (West Half), Haliburton County, Muskoka and Nipissing Districts (reprint); 1 inch to 2 miles	Topography.*
779A	Aylen Lake, Nipissing District and Renfrew County (reprint); 1 inch to 1 mile	Topography.*
48-9	Brechin, Ontario and Victoria Counties; 1 inch to 1 mile	Preliminary geological map. Paper 48-9.
48-12	Beaverton, Ontario. York and Victoria Counties; 1 inch to 1 mile	Preliminary geological map. Paper 48-12.
	Arnprior; 1 inch to 1 mile	Airborne magnetic series.
	ONTARIO AND QUEBEC	
684A	Stonecliffe, Nipissing District, Renfrew, Temiscamingue and Pontiac Counties (reprint); 1 inch to 1 mile	Topography.*
	QUEBEC	
240A	Opasatika Sheet, Temiscamingue County (reprint); 1 inch to 1 mile	Geology.*
242A	Escuminac Sheet, Bonaventure County (reprint); 1 inch to 1 mile	Topography.*

Maps Published—Continued

Publication Number	Title	Remarks
281A	Duparquet Sheet, Abitibi and Temiscamingue Counties (reprint); 1 inch to 1 mile	Geology.*
683A	McGillivray Lake, Pontiac County (reprint); 1 inch to 1 mile	Topography.*
911A	Sherbrooke; 1 inch to 1 mile	Geology.*
913A	Scotstown; 1 inch to 1 mile	Geology.*
950A	Russell Lake; 1 inch to 1 mile	Topography.*
951A	La Motte; 1 inch to 1 mile	Topography.*
975A	Bruce Lake; 1 inch to 1 mile	Topography.*
48-1	Lac Marrias, Abitibi, Pontiac and Temiscamingue Counties; 1 inch to 1 mile	Preliminary geological map. Paper 48-1.
48-3	Lac Marmette, Temiscamingue and Abitibi Counties; 1 inch to 1 mile	Preliminary geological map. Paper 48-3.
48-13A, B, C, D.	Louvicourt, Abitibi County (in 4 sheets); 1 inch to 1000 feet	Preliminary ground magnetic maps. Paper 48-13.
48-14A, B, C, D.	Bourlamaque, Abitibi County (in 4 sheets); 1 inch to 1000 feet	Preliminary ground magnetic maps. Paper 48-14.
48-15A, B.	Northern Dubuisson, Abitibi County (in 2 sheets); 1 inch to 1000 feet	Preliminary ground magnetic maps. Paper 48-15.
48-16	Southwest Vassan, Abitibi County; 1 inch to 1000 feet	Preliminary ground magnetic map. Paper 48-16.
49-1	Southeast Dubuisson, Abitibi County; 1 inch to 1000 feet	Preliminary ground magnetic map. Paper 49-1.
49-11	Southeast Vassan, Abitibi County; 1 inch to 1000 feet	Preliminary ground magnetic map. Paper 49-11.
	NEW BRUNSWICK	
960A	Pointe Verte; 1 inch to 1 mile	Topography.*
964A	Campobello; 1 inch to 1 mile	Geology.*
965A	Grand Manan; 1 inch to 1 mile	Geology.*
972A	Point Escuminac; 1 inch to 1 mile	Topography.*
973A	Wishart Point; 1 inch to 1 mile	Topography.*
984A	Forest City; 1 inch to 1 mile	Topography.*
985A	Fosterville; 1 inch to 1 mile	Topography.*
	NOVA SCOTIA	
260A	Lake Ainslie Sheet, Inverness County (reprint); 1 inch to 1 mile	Topography.*
48-6	Louisburg, Cape Breton County; 1 inch to ½ mile	Preliminary geological map. Paper 48-6.
48-11A, B.	Margaree and Cheticamp, Inverness County (2 sheets); 1 inch to ½ mile	Preliminary geological maps. Paper 48-11.

Maps Published—Concluded

Publication Number	Title	Remarks
	MISCELLANEOUS	
Volume III	Drilling and sampling of Bituminous Sands, Northern Alberta, cross-sections and plans of areas drilled. Wheeler Island, 8 cross-sections, 1 map. Steepbank River, 48 cross-sections, 1 map. Horse River, 25 cross-sections, 1 map. East Steepbank River, 12 cross-sections, 1 map. North Steepbank River, 1 cross-section, 1 map. Muskeg River, 21 cross-sections, 2 maps. Mildred Ruth Lakes, 15 cross-sections, 1 map.	
46-1 (Second Edition)	A Middle Triassic (Anisian) Fauna in Halfway, Sikanni Chief, and Tetsa Valleys, British Columbia. (half-tone plates of fossils).....	Palæontology Paper 46-1.

****For Separate Distribution***

Eight geological maps were with the King's Printer. Nine topographical maps, 15 Alberta coal maps, and three map figures were with the Geographical Section, Department of National Defence for printing. A geological map of Alberta, five standard geological sheets, nine preliminary geological maps, and four ground-water supply maps were in progress in the Division.

Surveys and Mapping Bureau

The Surveys and Mapping Bureau was formed to centralize the administration and co-ordinate the work of various units in the Department engaged in mapping, charting, and surveying. A greatly enlarged program of work by all divisions was undertaken.

To meet the greatly increased demand for maps for the study of natural resources and in their subsequent development, the personnel of the Bureau has been increased and new developments in technique and equipment have been studied and adopted where desirable. The increased rate of production is already noticeable.

Close co-operation is maintained with the Army Survey Establishment, Royal Canadian Engineers, and this avoids duplication of effort.

The activities of the five divisions of the Bureau follow.

Topographical Survey

The Topographical Survey is organized in two major units: the Topographical Mapping Section, which is responsible for field surveys, and the Air Survey Section, which plots and produces maps from air photographs with control provided by field surveys. A smaller unit, the Map Editing Section, is responsible for map editing and finishing.

The Topographical Survey carries out the field surveys and completes the resultant map manuscripts up to the stage of final draughting for all mapping by the Federal Government on medium and large scales. It also includes the National Air Photographic Library which is responsible for the indexing, preservation and distribution of prints from all air photography carried out by, or for, the Federal Government. At present, 1,789,000 prints are on record in the Library, as well as full information on all air photography in Canada carried

out by Provincial Governments and commercial companies. The staff of the Canadian Board on Geographical Names is provided by the Topographical Survey and the expenses of the Board are included in the vote of the Topographical Survey.

To meet the requirements of the accelerated mapping program, as approved by the Cabinet, the work of the Survey has been greatly expanded since the end of the war. The staff has increased more than five-fold in that period. Shortage of graduate engineers and higher salaries paid by industry have been a serious handicap in building up a field staff. It has been possible, however, to recruit and train a highly efficient group of technicians who are engaged in producing maps from air photographs. The result of that training is reflected in the map production of the Air Survey Section, which increased 95 per cent in the fiscal year.

Six Multiplex units for the accurate plotting and contouring of air photographs were brought into production. A further six units will be put into service as soon as suitable quarters are available. There was constant development and improvement in the equipment and technical details of the work throughout the organization.

The preparation and distribution of advance sheets, which make recent surveys quickly available to other Government organizations, Federal and Provincial, and to the public, is an important part of the work of the Topographical Survey. Seven thousand nine hundred and eighty-five advance prints were distributed.

The staff numbers 193, an increase of 41 during the year.

Topographical Mapping Section

The Section made original ground surveys for control of mapping from aerial photographs over an area of 63,560 square miles. These surveys were widely distributed across Canada and the methods adopted were those considered to be best suited to the varied conditions and purposes. Under an agreement with the Department of National Defence, nine of the parties were provided by the Army Survey Establishment.

Summary

Province	Number of Parties	Type	Scale	Area (Square Miles)
Northwest Territories	2	Planimetric	1" to 1 mile	2,080
	1	Planimetric	1" to 1000 ft.	150
	1	Special Levelling Project		136
Yukon Territory	1	Photo-topographical	1" to 1 mile	1,052
		" "	1" to 1000 ft.	
	1	Triangulation-approx.	100 mile net	
		Photo-topographical	1" to 4 miles	1,200
	10	" "	1" to 4 miles	25,500
British Columbia	6	Photo-topographical	1" to 4 miles	13,200
	1	" "	1" to 1 mile	600
Alberta	1	Topographical	1" to 2 miles	3,510
	1	Photo-topographical	1" to 1 mile	380
		" "	1" to 1000 ft.	
Saskatchewan	1	Planimetric	1" to 1 mile	1,440
Ontario	2	Topographical	1" to 1 mile	900
	1	Planimetric	1" to 1 mile	425
Quebec	2	Planimetric	1" to 1 mile	6,580
	1	Topographical	1" to 1 mile	420
New Brunswick	3	Topographical	1" to 1 mile	2,190
	1	Planimetric	1" to 1 mile	1,365
Nova Scotia	5	Topographical	1" to 1 mile	2,432
	41			63,560

Two senior officers were assigned to field supervision. One gave his attention to the photo-topographical parties in northern British Columbia and Yukon, and the other maintained general supervision over topographical mapping in Ontario, New Brunswick, and Nova Scotia.

Air Survey Section

The Section is organized in two sub-sections of four plotting units each and one multiplex sub-section of two plotting units. This organization provides for a close control of all phases of the work and a complete chain of responsibility for training and production.

Summary

Province	Number of Map Sheets	Publication Scale	Area (Square Miles)
Northwest Territories	3	1" to 1 mile	799
	1	1" to 1000 ft.	54
Yukon Territory	2	1" to 4 miles	9,112
British Columbia	2½	1" to 4 miles	12,352
	4½	1" to 2 miles	7,101
Alberta	20	1" to 1 mile	7,131
	2	1" to 4 miles	9,824
Saskatchewan	20	1" to 1 mile	6,603
	2	1" to 4 miles	10,244
Manitoba	32	1" to 1 mile	11,763
Ontario	9	"	1,942
Quebec	2	"	630
New Brunswick	29	"	10,802
Nova Scotia	13	"	3,355
Coastal Areas (for Hydrographic Service)	(4 areas)	1" to ½ mile	2,043
Total Planimetric Mapping			93,755

Map Editing Section

The work of the Section is detailed below:

Map Sheets Forwarded for Reproduction

Province	Publication Scale			Total	Area (Square Miles)
	One Mile	Two Mile	Four Mile		
Northwest Territories	3			3	748
Yukon Territory					
British Columbia		4			5,365
Alberta		4		4	5,434
Saskatchewan	13		1	14	9,487
Manitoba	27		3	30	25,498
Manitoba—Ontario	4			4	1,520
Ontario	2			2	844
Ontario—Quebec	2			2	830
Quebec	4			4	1,607
New Brunswick	30			30	10,672
Nova Scotia	1			1	150
Prince Edward Island					
	86	8	4	94	62,155

Special Map Projects Forwarded to Geological Survey

	Projects	Square Miles
Yukon Territory	1	16
Northwest Territories	1	140
Quebec	1	25
Total	3	181
Grand total projects forwarded*	101	62,336

*This total comprises 141 map manuscripts.

Advance Information Tracings Prepared

Northwest Territories	5
Yukon Territory	1
British Columbia	22
Alberta	28
Saskatchewan	19
Manitoba	40
Ontario	9
Quebec	3
New Brunswick	39
Nova Scotia	14
	180

Two hundred and eight projections were drawn to various scales and 208 manuscripts were mounted on metal. Numerous index maps, charts, and special drawings were prepared.

National Air Photographic Library

The Library preserves one print of each air photograph taken by, or for, the Federal Government. It prepares indices showing their geographical location and arranges to obtain such additional prints as may be required for Government services or for purchase by the public. It maintains a record of all photography by Provincial authorities or private interests.

One print of each of 184,268 new aerial negatives were added to the collection. Of these, 63,189 were prints of trimetrogon negatives covering approximately 414,000 square miles, including areas in northern Quebec, Labrador, and the Northwest Territories. The remainder were prints of vertical negatives covering approximately 386,000 square miles, including areas in all the provinces, the Northwest Territories, and the Yukon. One print of each of approximately 1,789,000 aerial negatives covering an area of more than 2,600,000 square miles are now on file in the Library.

The importance of aerial photography to modern mapping techniques and to the development of natural resources was in evidence again by the broad and increased use of aerial photographs by various agencies and Government Departments. This was reflected by the number of visits to the Library of scientists, teachers, engineers, geologists, timber operators, and tour planners, to examine photographs covering areas in which they were interested. The Library is equipped to give technical advice and assistance in photographic interpretation.

One thousand seven hundred and nineteen requisitions covering the purchase of 284,773 prints of aerial photographic negatives were forwarded to the Photographic Establishment of the Royal Canadian Air Force. These prints were for transmission to Federal and Provincial Government services, engineering, commercial and educational institutions, and to private individuals.

Canadian Board on Geographical Names

Order in Council P.C. 3397 of August 3, 1948, changed the name of the Geographic Board of Canada to the Canadian Board on Geographical Names and brought up to date the authority, functions, and membership of the Board.

Names for 88 maps and 49 hydrographic charts were adopted and many new names and name changes were considered. A revision of the Board's regulations, principles of nomenclature, and by-laws was published and considerable work was done preparing for a forthcoming Gazetteer of Canada series.

On the retirement of F. H. Peters, K. G. Chipman, Chief Topographical Engineer, was elected Board Chairman. New members appointed to the Board include P. E. Palmer, M. G. Cameron, and A. McFarlane. The present membership of the Board is: chairman, K. G. Chipman; executive committee, C. H. Smith, R. J. Fraser, M. G. Cameron; members, Norman Fee, J. G. Wright, F. J. Alcock, P. E. Palmer, A. McFarlane: provincial members, W. G. H. Firth, British Columbia, H. P. Brownlee, Alberta, A. I. Bereskin, Saskatchewan, H. E. Beresford, Manitoba, F. W. Beatty, Ontario, J. G. B. Pugh, New Brunswick, A. E. Cameron, Nova Scotia, Honourable J. Walter Jones, Prince Edward Island; secretary, L. B. Skinner. (The Province of Quebec has an independent Board which co-operates with the Canadian Board of Geographical Names on matters pertaining to that province.)

Canadian Hydrographic Service

The specific activities of the Service include detailed charting of the coastal and inland waters of Canada; production and distribution of nautical charts and volumes of Pilots and Sailing Directions; investigation of tides and currents; and issuing of standard Tide Tables for the Dominion. The Service also records the water-level fluctuations of the Great Lakes-St. Lawrence Waterway and disseminates concise information pertaining thereto. Consultative services covering a wide field of marine activities are rendered to shipping.

At the close of the war, charting facilities were at low ebb. The technical staff had been reduced to a mere nucleus. There was no hydrographic ship on the Canadian Atlantic seaboard. Of the two prewar vessels the *Cartier* had worn out in naval duty and the *Acadia* had to undergo complete refitting and extensive repairs. The established long-term charting program at sea had been disrupted by emergency requirements.

In addition to this backlog of charting, three developments have created other demands for hydrographic work, namely the broad scientific development of Canadian Arctic regions, the inclusion of Newfoundland into Confederation, and the increasing activities in the Mackenzie River-Great Slave Lake area.

Toward meeting this expanded demand the Hydrographic Service effected technological advances in hydrographic operations afloat and ashore, enlisted additional cartographic staff, and acquired new ships and charting equipment.

The Hydrographic Fleet

At Midland, Ontario, the new hydrographic ship *Cartier* was launched to replace the former vessel of the same name. Principal dimensions of the ship are: length, over all, 139½ feet, breadth 26 feet, draught 12½ feet. She is powered with a diesel engine and develops a speed of about 12 knots. Fuel capacity is 15,000 gallons which gives her a cruising radius of about 6,000 miles. A main feature is low operating cost. The vessel is fitted with the latest scientific instruments for navigation, charting, and oceanographical work. Accommodation is provided for a complement of 28 including four hydrographers. The ship made her maiden voyage in November.

Possession of a well-balanced hydrographic fleet is now in sight. The west coast establishment includes the *W. J. Stewart* and the *Parry;* on the Atlantic are the *Acadia* and the new *Cartier.* Charting in the Great Slave Lake-Mackenzie River district is done by the modern motor-launch *Rae.* For conducting special hydrographic work on the eastern seaboard and in northern waters two major vessels, ex-Algerine minesweeper class, were under conversion at the close of the year. They will carry several stoutly built echo-sounding motorboats for use in charting inshore waters and for shoal-examination purposes. During the year, nine vessels of various classes were completed. Six others were well advanced in construction or conversion stages.

At the close of the fiscal year the British Admiralty announced that, in re-scheming its charts of the British Columbia coast, it proposed to withdraw from circulation between 24 and 40 harbour charts and to rely on Canadian charts should the need arise. Admiralty policy will be to confine its own chart coverage of Canadian seaboards to general coast-sheets and intermediate-scale charts, and to depend upon the Canadian charting authorities to survey and supply detailed charts of harbours, coastal waterways, and inshore waters. For the Pacific coast alone this decision places upon the Canadian Hydrographic Service increased and continuing responsibilities.

A major project requiring to be undertaken is the hydrographic survey of the exposed seaboards of Newfoundland. The consummation of Union has added some 6,000 miles to the coastline of Canada. The need for charting of this area is indicated by the several cautionary notes which appear on existing charts of the Atlantic coast of the Island. There is even greater need for charting the coastal waters of Labrador. Accurate data pertaining to tides and currents are also much needed.

Great Lakes Tourist Trade

The most important demand for new charting, apart from naval and merchant marine requirements, came from the waterborne tourist trade. Particularly in demand were large-scale charts of the inner waters of Georgian Bay. The locality is ideal for motor-cruising, but the area is inadequately charted for present day purposes. Survey vessels, equipment, and personnel are being acquired to fill this need. To meet requirements of the large fleet of watercraft which use the Trent Valley Waterway, a set of charts of that system was nearing completion at the close of the year. The existing charts of the Lake of the Woods, and of the Rideau Lakes Route had wide sale to yachtsmen from United States and Canada.

Pilots and Sailing Directions

The standard volumes of Pilots and Sailing Directions, like the charts, must be kept up-to-date. Official supplements to the original volumes are published from time to time as sufficient data becomes available. Urgent navigational items, such as the discovery of submerged dangers, are advertised in the Official Notices to Mariners issued by the Department of Transport.

In the fiscal year under review new editions of the following publications were issued: Great Lakes Pilot, Vol. I, 2nd edition; Great Lakes Pilot, Vol. II, 6th edition; two other volumes and one supplement were prepared and sent to the Printer. A library of latest navigation charts and volumes of Pilots and Sailing Directions published by the British Admiralty and by the various United States authorities is maintained as part of a ready-reference service for providing information to the seagoing public.

The Tidal and Current Section continued to supply the seafaring trades with information pertaining to tides and tidal streams in coastal and estuarial waters. The work of this Section covers the investigation of tidal phenomena

on the Atlantic and Pacific seaboards as well as in Hudson Bay, Hudson Strait, and certain Arctic waters. The resultant information is issued in tide tables and other publications which give accurate predictions for the times and heights of tides, and the time of turn of tidal currents. In accordance with international agreement, tidal data are made available to other Hydrographic offices on a reciprocal basis.

National and International Co-operation

Acknowledgment is made of the co-operation extended by other Government and shipping interests engaged in the development of navigation. Much useful data were received from the International Hydrographic Bureau at Monaco, the Hydrographic Department of the Admiralty, the United States Hydrographic Office, the United States Coast and Geodetic Survey, and the United States Lake Survey Office.

The regular supply of navigational data received from several Canadian Government Departments was augmented to include information on Arctic waters.

Marine research again covered a wide range of activities. The primary object of this work is to provide answers to questions submitted by the seafaring trades. Within this category are such matters as recommended ship routes, distances between transoceanic ports, magnetic variation, action of tidal currents, and comparative sea temperatures in connection with the shipping of perishable products. Mathematical computations for triangulation, geographic positions, true bearings, and certain chart projections for wireless direction-finding purposes, are also performed.

Oceanography

The membership of the Canadian Joint Committee on Oceanography, created in 1946, was expanded to include the Canadian Hydrographic Service and plans were laid for co-operative and oceanographic surveys around the Atlantic coasts. The Canadian Joint Committee now comprises representatives of the Royal Canadian Navy, the Fisheries Research Board of Canada, the National Research Council and the Canadian Hydrographic Service. On the British Columbia coast the Canadian hydrographers prepared the ground for the Nodales co-operative oceanographical project by a special rapid charting of the area.

Hydrography

As a result of hydrographic work in Canadian coastal and inland waters there have been placed on the charts thousands of hitherto unknown shoals and reefs.

Regional long-term hydrographic programs are established in accordance with the needs of mercantile development and coastal defence. Seasonal projects are undertaken to meet navigational requirements. Some hydrographic projects cover extensive areas of coastal, estuarial, or inland waters; others are confined to the large-scale charting of harbours, roadsteads, or anchorages. Frequently, emergency charting is concentrated on the detailed examination of small offshore areas suspected of dangerous shoals. In charting, where safety of shipping is the predominating factor, operations are conducted according to precise specifications.

In the period under review, nine charting units were detailed for work in coastal and inland waters. In no one year were hydrographic projects more widely dispersed. Following is a summary of the projects.

Atlantic Coast and Inland Waters

Bay of Fundy

This unit made a detailed hydrographic examination of the waterfront at H.M.C. Dockyard, Halifax. Equipped with the echo-sounding launches *Dawson* and *Anderson* the party then engaged in a detailed survey of Seal Cove and Long Island Bay in Grand Manan Island, and of Friar Roads in Passamaquoddy Bay. On completion of the latter undertaking, the charting of Grand Manan Island was resumed and extended to include the whole of that Island with the surrounding offshore reef-infested area. Depths in Courtenay Bay Channel, Saint John Harbour, were examined.

As a result of the work, large scale harbour charts of Seal Cove, Long Island Bay and Friar Roads will be made available. The season's work included: boat sounding, 450 linear nautical miles; coastlining, 45 linear nautical miles; and shoals examined, 26.

Gulf of St. Lawrence

While the C.G.S. *Acadia* was being fitted out and equipped with radar, shoal examinations were conducted in Northumberland Strait, and a large-scale survey was made of the entrance to Caribou Harbour Channel. The latter work was undertaken at the request of the Department of Public Works. The exposed St. Paul Island vicinity was charted in detail, including the four principal coves of the island which were surveyed on large scale. The vessel then proceeded to St. Georges Bay, Nfld., where hydrographic operations were carried out in the inner part of that bay, including St. Georges Harbour. Humber Arm, Nfld., eastward of Meer Point and including Corner Brook, was then charted.

As a result of the operations there will be made available detailed charts of St. Paul Island, St. George's Bay, and Humber Arm. In compliance with a request of the Nova Scotia Power Commission a report on water-temperatures in Pictou Harbour was prepared. The season's work included: ship sounding, 111 linear nautical miles; boat sounding, 648 linear nautical miles; coastlining, 84 linear nautical miles; and shoals examined, 83.

Northumberland Strait

This unit, with the use of the hydrographic motor-cruiser *Henry Hudson* and a smaller launch, did a large-scale charting of Souris Harbour and approaches and started on the coastal survey in the vicinity. Souris Harbour is an important fishing station, a convenient harbour of refuge, and a port of call for the steamer running from Pictou to the Magdalen Islands. Hitherto, however, Souris Harbour was shown only on the small-scale general chart of Northumberland Strait made more than a century ago. As a result of the season's work a modern chart "Souris Harbour and Approaches" will be available and the Sailing Directions covering that port will be brought up to date. The season's work included: boat sounding, 419 linear nautical miles; coastlining, 19 linear nautical miles; and shoals examined, 9.

St. Lawrence River

The detailed recharting of the St. Lawrence River was completed from Pointe Citrouille (below Three Rivers) to Montreal. The work was done by a small unit equipped with an echo-sounding launch. The party marked the channel leading into Valleyfield Harbour for buoy-laying purposes. It then completed the charting of the river from Lavaltrie to Longue Pointe. Rivière des Prairies was sounded to the foot of Ile Jésus and for navigational purposes, current velocities and directions in the St. Lawrence River were determined at depths of 6, 18, and 30 feet. A thorough examination was made in connection with a ship-grounding on the bank extending off Ile aux Coudres in the lower

St. Lawrence. As a result of the season's operations, a new chart "Lavaltrie to Longue Pointe" will be made available. The seasons work included: boat sounding, 164 linear nautical miles; coastlining, 21 linear nautical miles; and shoals examined, 10.

C. G. S. "Cartier"

While this vessel was under conversion from a minesweeper hull to a hydrographic ship at Midland, Ontario, a small party equipped with a motor-boat, conducted charting operations at Depot Harbour and vicinity. Late in the season the *Cartier* conducted a reconnaissance survey of a possible new channel into Parry Sound. En route to Pictou, N.S. an official inspection of the vessel was made at Prescott by the Minister of Mines and Resources and Departmental officials. At Cape Tormentine, in accordance with a request from the Department of Transport, a new ship-range leading to the new ferry terminal was located. The season's work included: boat sounding, 151 linear nautical miles; and shoals examined, 13.

Chesterfield Inlet—Baker Lake

Navigation in this inlet in the northwest part of Hudson Bay has been handicapped by lack of charts. Prior to this Service undertaking a regular charting of the waterway, a hydrographer conducted a brief reconnaissance aboard the commercial motor-vessel *Regina Polaris* out of Churchill. The inlet pierces the land for a distance of 150 nautical miles, varies in width from 15 miles in the lake to one-half mile at the narrows. Depths, obtained en route by echo-sounding, proved that the hydrography is highly irregular, the soundings varying from 70 fathoms near the entrance to less than 2 fathoms at the outlet of Baker Lake. It is hoped that detailed charting may reveal depths which will permit ships of greater draught to navigate.

Great Slave Lake

With the development of the Northwest Territories, the inland waterways of this region have assumed major importance. To meet the need for charts a major hydrographic project is being conducted in the Great Slave Lake-Mackenzie River system.

In the 65-mile stretch of open water from Slave Point to Hardisty Island, detailed charting operations have disclosed the existence of six anchorages or harbours of refuge. Their availability permits safe navigation in weather that otherwise would be prohibitive.

Charting operations were conducted in the area from Moraine Point to Gypsum Point, the work being concentrated principally in the vicinity of Hardisty Island off the western entrance point to the North Arm of the lake.

The hydrographic party was equipped with the 48-foot motor-cruiser *Rae* and a 28-foot launch, both installed with modern echo-sounding instruments.

As a result of the work the following charts will be published: "Mirage Point to Hardisty Island", "Hardisty Island to North Head", "North Head to Moraine Point". Large additions will also be made to the general chart of the southern part of the lake. The season's work included: boat sounding, 2,005 linear statute miles; coastlining, 85 linear statute miles; and shoals examined, 21.

Pacific Coast

Charting of the coast and coastal waters of British Columbia is directed from the District Hydrographic Office at Victoria, which office serves also as the main distributing centre for navigational publications pertaining to that seaboard. Seasonal charting projects are undertaken in accordance with the established program of systematic charting, priorities being allotted to meet the most urgent requirements of naval and mercantile shipping. Charting operations in the more exposed waters are conducted by the *Wm. J. Stewart.* A smaller ship, the *Parry,* is used for surveying the inlets and protected inshore areas.

The *Wm. J. Stewart* cleared from Victoria on May 19 for echo-sounding testing and regular charting duties in Nodales Channel vicinity. On completion of the latter project operations were carried on in the Banks Island area, in Smith Inlet, and in the Queen Charlotte Sound areas. During the remainder of the season minor surveys were undertaken in Prince Rupert Harbour, Nanoose Bay and Nanaimo Harbour, Genoa Bay, Sidney Island, and Victoria Harbour, a more extensive project being the resounding of the offshore approaches to Esquimalt and Victoria Harbours for the completion of a new large-scale chart.

The season's work included: ship sounding, 1,080 linear nautical miles; boat sounding, 2,312 linear nautical miles; coastlining, 227 linear nautical miles; and shoals examined, 1,327.

The *Parry* conducted detailed hydrographic operations in Seechelt Inlet, Tolmie Channel, Graham Reach, Fraser Reach, Hiekish Narrows, Sheep Passage, and Matheson Channel. The season's work included: ship sounding, 91 linear nautical miles; boat sounding, 656 linear nautical miles; coastlining, 254 linear nautical miles; and shoals examined, 125.

Tides and Currents

The Service is responsible for the investigation and analysis of tides and tidal action, and for the compilation of the resultant data for the use of mariners, fishermen, engineers, and others engaged in the seafaring trades. The information is published in annual official tide-prediction tables, tidal current charts, comprehensive tidal references on standard navigation charts, and special publications dealing with tidal phenomena on various parts of the coast. New information for the refinement or extension of existing data is continually studied and tabulated. To enable this, 16 tidal stations are maintained in constant operation on the eastern and western seaboards.

Preparation of the various editions of the Tide Tables for 1949 was completed, and considerable progress was made on the manuscript for the 1950 tables. The Tide Tables are sold through the Department of Public Printing and Stationery. Large quantities are acquired by the Department of Fisheries for distribution to fishermen generally.

Two complete editions of the Tide Tables are produced; one for the Atlantic Coast and one for the Pacific Coast are published for shipping interests generally. Six abridged pocket editions serve the needs of fishermen and others locally: four cover the east coast and two the west coast. The publications are classified as follows.

Atlantic Coast Tide Tables

"Tide Tables for the Atlantic Coast of Canada", complete edition, includes all information available for the Atlantic Coast, including Newfoundland and Hudson Bay. Four pocket editions for local use are also issued. These are: Quebec and Father Point; Charlottetown, Pictou and St. Paul Island; Halifax and Sydney; Saint John and Yarmouth. Special tide tables in mimeograph form were prepared for Nelson, Manitoba, and for the "Bore" at Moncton, N.B.

Pacific Coast Tide Tables

"Tide Tables for the Pacific Coast of Canada", complete edition, contains all available information for the Pacific Coast. In addition, two pocket editions for local use are printed. These are: Vancouver and Point Atkinson, and Prince Rupert and Northern British Columbia. The 1949 editions contain considerable new data.

Other publications dealing with tides and currents are: "Tables of the Direction and Velocity of the Currents in the Bay of Fundy and its approaches"; "The Currents in the Gulf of St. Lawrence"; "The Currents in the Entrance to

the St. Lawrence"; "The Currents in the Estuary of the St. Lawrence, Ste. Anne des Monts to Father Point"; and "Tidal Current Charts for the hourly stages of the tide, Orleans Island to Father Point".

Publications not bearing specifically on navigation are "Tide Levels and Datum Planes, Atlantic Coast"; "Tide Levels and Datum Planes, Pacific Coast"; "Temperatures and Densities"; "Tides at the Head of the Bay of Fundy"; and "Tides and Tidal Streams".

The principal tidal stations maintained in operation are:

Atlantic Coast

Quebec, Chicoutimi, Father Point and Harrington, P.Q., Charlottetown, P.E.I.; Saint John, N.B.; Halifax, N.S.; Churchill, Manitoba.

Pacific Coast

Vancouver, Point Atkinson, Victoria, Comox, Alert Bay, Canoe Pass, Clayoquot, Prince Rupert, B.C.

Special Investigation of Tides and Tidal Streams

On the Pacific Coast a current survey was conducted at Active Pass. As a result of this work the 1950 tide tables will include complete current tables for this important passage. The fast steamers between Vancouver and Victoria effect a savings in time and mileage when using Active Pass, and an hour by hour knowledge of the strong tides at this place is of considerable value.

Information Service

Much specialized tidal data, including tables for the arrival of the bore on the Petitcodiac River at Moncton, were furnished to navigation interests, engineers, coast industries, municipalities, and Government Departments.

Precise Water Levels

This Section is responsible for recording, tabulating, and co-ordinating the water-level fluctuations of the Great Lakes-St. Lawrence Waterway from Port Arthur to Quebec. The work is required in connection with lake and river-level control, power development, municipal engineering, and especially for navigation. Results of the investigation are also used for the establishment of official low-water data for hydrographic chart use. A complete system of continually operating, self-registering gauging stations is maintained on the Canadian side of the International Boundary, and the results can be readily co-ordinated with related data obtained by United States authorities. A preliminary study of the water-levels of the Great Slave Lake-Mackenzie River system has also been underway in recent years.

Self-registering gauges were maintained at 48 stations on the Great Lakes, the St. Lawrence River, and the lower Ottawa River. Recordings were made over 528 months. Some 750,000 water-surface elevations were reduced and compiled into comprehensive statistical tabulations. Twelve monthly, five annual, five graphical, and six general data bulletins were issued. The Canadian Press Association was furnished with a concise synopsis of each monthly Water-level Bulletin for publication in marine sections of newspapers and periodicals. Close co-operation was continued with, and extensive data supplied to engineering, construction, power and marine interests of Federal and Provincial Government Services, as well as to public utilities and private enterprises active on the many diversified problems pertaining to the waterway.

Chart Construction and Reproduction

The work of this Section covers the various processes of navigation-chart cartography from the results of field operations to the printing stage. The work is divided into two subdivisions, namely, chart compilation, and chart drafting. All navigation charts must be corrected to the date of issue to the trade.

An average of 100 charts were continuously in various stages of production.

The staff situation was bettered considerably by the addition of several draughtsmen, and by the results from the policy of student training.

Ninety-five charts and other nautical publications were printed as follows: standard charts, first editions 14; revised editions 34; reprints 31. Special charts 6, index maps 5; tidal diagram forms 5.

A list of nautical charts published during the fiscal year may be obtained by mariners or interested persons on application to the Chief Hydrographer, Canadian Hydrographic Service, Department of Mines and Resources, Ottawa.

Chart Distribution

Canadian Hydrographic Service publications such as navigation charts, volumes of Pilots and Sailing Directions, and Tide Tables, are sold either directly from Hydrographic Headquarters at Ottawa and Victoria, or through other Government and commercial chart-agencies in principal coastal and inland ports. Following is a record of the average annual distribution of standard and special navigation charts during the five three-year periods since 1934:

	1934–36	1937–39	1940–42	1943–45	1946–48
Standard navigation charts	10,782	17,044	31,905	51,450	46,708
Special plotting sheets, instructional charts, etc.	0	0	9,014	45,644	182

The significant fact is that postwar distribution of standard navigation charts, has been over 2½ times that of the corresponding prewar period.

Hydrographic publications distributed during 1948 were: Catalogue of Charts, Sailing Directions and Tidal Information with Index Maps, 1,601; Navigational Charts, 45,163; Pilots and Sailing Directions, 809; Supplements to Pilots, 98; Tide Tables, 52,755; Water-level Bulletins, and Graphs, exclusive of those distributed through Notices to Mariners, 10,933.

Canadian Hydrographic charts and publications are reproduced by other Hydrographic Offices for use of their own vessels. The total world circulation of Canadian charts is, therefore, greatly in excess of the above figures.

Geodetic Survey of Canada

The Geodetic Survey of Canada continued its basic function of establishing horizontal and vertical control in various areas across Canada. Substantial progress was made towards increasing the existing framework to the immediate north of the settled areas and in extensions therefrom. The expanded program of northern development will require more maps at larger scales than are now available and for this a corresponding density of control is necessary.

The development of natural resources and changing economic conditions have required work of a special nature on several projects. Triangulation has been extended northward to within 50 miles of the Labrador iron fields and during 1949 it is expected to be advanced to and beyond the area, providing basic control to which auxiliary nets may be attached as development occurs. The immediate needs for the South Saskatchewan River Project and of the Red Deer River Project, irrigation schemes under the Prairie Farm Rehabilitation Act, were attended to through the establishment of 144 elevation marks. In the Yukon the elevation at various points on the Lewes River and at Lake Laberge were determined in connection with a study of waterpower installations. In the Ottawa area near Bryson, Quebec, reliable level data was obtained for the Quebec Hydro-Electric Commission for use in the construction of a dam on Rocher Fendu channel of the Ottawa River.

The application of electronic devices to surveying has been thoroughly studied, and at present, the method known as Shoran is being tested over the geodetic framework in Ontario and Quebec. The results so far obtained give every indication of sufficient accuracy for its use in expanding control rapidly into northern areas.

The development of productive oil fields in the West has increased the demand for vertical and horizontal control data on the part of geophysical and oil exploration companies. At least one company has been forced to adopt Shoran methods of flight-control in its efforts to have maps of sufficiently large scale to plot the results of its ground surveys.

The many demands for control data were met by distribution of publications, by revised lists of data in blueprint form, and by typing. With an increase of data the only efficient way of satisfying these demands is through publication, and efforts are directed towards collecting and publishing information as soon as results in a large area are adjusted to the main framework of either triangulation or levelling.

The 1948 field operations added the following to the available system of control: triangulation, axial length 400 miles, 107 stations; levelling, 796 miles, 391 bench marks; exploratory astronomic fixations, 44 stations; Shoran, 19 stations prepared for antennae sites and their elevations determined by barometric means. The elevations of four large lakes in intermediate areas were also obtained.

Shoran

A project to study and develop the application of Shoran to mapping and control in Canada was undertaken a little over a year ago under the auspices of the Associate Committee on Survey Research of the National Research Council. The Geodetic Survey worked on the project in co-operation with the Royal Canadian Air Force and the National Research Council, in so far as it affected triangulation control.

In the development of northern areas, maps of larger scale than those formerly available and with more detail, are considered essential. Towards this end it is first necessary to establish rapidly a control system of high accuracy upon which aerial surveys may be based. Visual methods of triangulation are too slow because of the short field season and the difficulties of transportation. Electronic methods, whereby lines up to 500 miles in distance may be measured to a fairly high degree of accuracy are now available, and are being investigated and proven over the geodetic framework in Ontario and Quebec. Results to date indicate that the equipment at present in use has proven to be satisfactory and capable of giving a sufficiently high degree of accuracy in control for northern mapping operations, and that the positioning of stations secured by Shoran is definitely of much superior accuracy to that obtained by astronomic fixation, the only alternative method with regard to the time factor.

In contrast with visual methods where length of lines may average from 20 to 40 miles, the selected Shoran system of triangulation has 67 lines to be measured electronically of which the shortest is 80 miles and the longest 310 miles, with an average length of 203 miles. Control may be established over a wide area in relatively short time by this method. Wherever a greater density of control is needed, this may be affected by visual methods of triangulation based upon two Shoran stations.

Further advantages of Shoran control arise from its attachment to the existing geodetic framework, so that all stations exist on a common basis, and from the manner in which two stations forming a base may be used to determine the positions of a plane while flying a photographic mission.

One party was employed in northern and central areas of Manitoba and Saskatchewan in the selection, preparation and monumenting of 19 sites as Shoran ground stations in anticipation of line-measurement flights in 1949.

A party was assigned to barometric work to obtain the elevations of the sites and of the larger lakes. The barometric data were taken four times a day for a 10-day period at each site, and were reduced by the Meteorological Service in Toronto, as corrections from the world-weather maps for the exact times of observation are necessary.

A party was employed on exploratory astronomic fixation of the monumented sites, this type of information being necessary for aids to the navigator and to the ground crews in setting directional antennae.

Triangulation

In continuation of its policy of providing triangulation networks for the systematic mapping and development of Canada, the Geodetic Survey organized four triangulation parties to extend its operations in the following areas: between the International Boundary and the 51st Parallel of latitude in southern Saskatchewan; the Sault Ste. Marie area of Ontario; the Ashuanipi Lake area of northern Quebec and Labrador; and the Alaska Highway area in Yukon and northern British Columbia. A small secondary scheme in the Waterton Lakes area of southern Alberta was also undertaken by the Saskatchewan party to attach to the geodetic framework the Rocky Mountain net of the Topographical Survey in that area. In addition to these four main parties, one officer conducted an aerial reconnaissance of the area north from Ashuanipi Lake to Fort Chimo in northern Quebec and also reconnoitered for a base line site to control the primary net north of Sault Ste. Marie.

Considering the trend of future development in Canada, particularly in northern Canada, there are several additional areas where it would be desirable to inaugurate new networks, or to extend existing triangulation, as soon as it is possible to recruit and train personnel to supervise and carry out the field work involved.

Accounts of the field program follow.

Yukon and Northern British Columbia

Along the Alaska Highway a primary net was projected as an extension of the United States Coast and Geodetic Survey Yukon-Alaska triangulation from the vicinity of Whitehorse. Its immediate function is to provide control for mapping along the British Columbia-Yukon boundary and the area adjacent to the Alaska Highway. Eventually this net will be extended to effect a junction with the primary net in the vicinity of Edmonton. Operations in this area were under the direction of F. P. Steers.

During the past several seasons climatic conditions during June, July, and August have been generally unfavourable for primary triangulation in the area between Whitehorse and the Cassiar Mountains, resulting in less progress than the average for other localities. In an attempt to increase the progress and as an experiment to determine the utility of helicopters for triangulation and Shoran operations in mountainous and other difficult areas, arrangements were made to supply a helicopter to assist this party. It was the first trial of this type of aircraft on Geodetic Survey work in Canada.

Although the results of one season's trial are insufficient to form an accurate opinion, it is felt that in its present stage of development the type of helicopter used cannot be considered economical for similar work elsewhere.

Eleven new stations were selected, 12 stations were prepared, and observations were completed at 12 stations. Three stations were re-occupied to improve the accuracy.

The helicopter was used 210 flight hours on 10 flights for reconnaissance and on 78 flights for the transport of men and equipment to and from stations difficult to reach on foot.

Saskatchewan

J. H. Kihl conducted primary triangulation operations in Saskatchewan and secondary work in southern Alberta. The work commenced from two stations established in 1929 about 30 miles south of Watrous, Saskatchewan, and directed toward forming a junction with the network along the International Boundary. Two stations in the International Boundary net were occupied and observed, thus completing approximately 125 miles and closing the 1,200-mile loop of triangulation. This 125-mile gap in the loop covering portions of the Provinces of Alberta and Saskatchewan and including 250 miles of triangulation along the International Boundary has existed since 1929. Its successful completion will make possible completion of the computation and adjustment of the loop and fix the positions of these stations on the 1927 North American Datum.

In addition to the five stations of the secondary network in the Waterton Lakes area, this party completed observing at 19 stations of the primary net and construction of seven towers averaging about 20 feet in height. The party also built two reference monuments, one new station monument, and made connections from 11 of the triangulation stations to D.L.S. section corners .

Ontario

Triangulation control near Portage du Fort, Quebec, was extended to the immediate vicinity of the Ottawa River to aid surveys in connection with development by the Ontario and Quebec Power Commissions.

Work in the area north of Sault Ste. Marie was continued by two independent parties. K. C. Dennis was in charge of the reconnaissance and station preparation, and L. G. Bangs supervised the work of the observing parties. Work in this area is the continuation of the primary network that now extends over the settled portions of eastern Canada. At the end of the season the work had reached a point approximately opposite Michipicoten Island, and it is intended that this network will eventually effect a junction with the triangulation along the 49th parallel in southeastern Manitoba. The immediate objective is intended to provide control for the aerial mapping program of the Ontario Department of Lands and Forests, now under way.

Both parties were handicapped by smoke from the Mississauga and Chapleau forest fires. An unfortunate accident resulted in the death, by drowning, of Edward Armstrong of City View, Ontario.

Nine new stations were selected, 10 stations were prepared for observing, and observing was completed at 13 stations. In addition a four-mile base line was located and opened for posting and measurement in 1949.

Northern Quebec and Labrador

The work, in charge of J. V. Thompson, consisted in the extension of a secondary network, which was commenced in 1945 from the primary network along the Gulf of St. Lawrence, to provide control for a possible survey of the Quebec-Labrador boundary and for surveys connected with the development of the highly mineralized area in central Ungava. During 1947, the work was carried to the southerly end of Ashuanipi Lake, and during 1948 the network was extended for approximately 125 miles to the 54th parallel of latitude. It is planned to extend this network as far as Fort Chimo following the Swampy Bay, Kaniapiskau, and Koksoak Rivers.

The earlier opening of Ashuanipi Lake made is possible to accomplish a considerable amount of work in locating and clearing a 2·5-mile base which was later posted and measured, and the construction of several towers and targets in this area before the ice moved out of the main part of the lake and rivers to the north.

In maintaining communication with the base of supply at Seven Islands and between the various sub-parties, the Geodetic Survey is indebted to Labrador Mining and Exploration Company Limited for permission to use the radio facilities at Ashuanipi and Knob Lakes in conjunction with the portable P.F.I. transceivers carried by the parties.

Twenty-three new stations were selected and prepared including the construction of six towers averaging 27 feet in height. Observations were completed at 22 stations.

Triangulation Adjustments

Steady progress was made with the final loop-closure adjustments and computations of the arcs of triangulation comprised in the Alberta-British Columbia 1,646-mile loop. The consecutive sections of the loop, extending from the Sweetgrass Hills near the International Boundary, northerly through Calgary to Edmonton, and then westerly through Jasper to the Williams Lake area, were completed, as was another short section extending from the Vancouver area northeast to Kamloops.

A preliminary adjustment was made of a second-order net extending south from the Saskatoon area, through Regina, to the International Boundary, and which forms part of the 1,200-mile Alberta-Saskatchewan loop. From the adjustment of this net, the closure in position at Fife Lake geodetic station near the 49th parallel was 0·150 in latitude and 0·768 in longitude, a hypotenuse distance of 53·4 feet. The sections of the loop extending from Edmonton to Saskatoon, and from Saskatoon south to the International Boundary will be made to absorb the entire closure. The ratio of closure to total axial length of these sections (568 miles) is 1/56,000.

At the request of the Commission of Government of Newfoundland, a loop-closure adjustment of a second-order net of triangulation in the Notre Dame Peninsula was almost completed. Supplementary triangulation comprising lighthouses in the same area awaits attention.

The Topographical Survey second-order net in the Quebec Dyke Lake iron-ore area has been adjusted and computed upon a local astronomical datum. It is expected that this net will be connected in 1949 to the geodetic arc being extended from Seven Islands, Quebec, north to Ungava Bay.

Preliminary computations were made on the Yukon primary, the Sault Ste. Marie-Lake Superior primary and the Moisie River secondary nets. Final adjustment awaits establishment of controls in length and azimuth.

Elevations of the triangulation stations in the Lac Seul net, the Williams Lake-Jasper net, and the Newfoundland Notre Dame Peninsula net were determined from the adjustments of the zenith distance observational data. Preliminary elevations were calculated for stations in the Moisie River and the Sault Ste. Marie-Lake Superior nets.

The precise traverse extending from Cochrane, Ontario, northward along the Timiskaming and Northern Ontario Railway to Coral Rapids, was recomputed on the 1927 North American datum.

A study of the shape of the geoid pertaining to Canada has been commenced, using as basic data the observed deflections of the vertical at 266 triangulation stations. The geoidal contours give an indication of those areas that are relatively high in density and thus supply a lead towards further geophysical investigations.

Supplementary to the final adjustment of arcs of triangulation in western Canada, all available ties to section corners of the Dominion Lands Surveys System were computed and the co-ordinates of these corners calculated in terms of latitude and longitude.

A great deal of geodetic information and mathematical data were compiled and distributed at the request of Federal and Provincial Survey Bureaus, the United States Lake Survey, the Ontario Hydro-Electric Commission, geophysical oil exploration companies, aerial photographic survey companies, private engineers, geologists and surveyors.

Levelling

Three double unit parties were in the field, one in Ontario and Quebec, one in Saskatchewan and Alberta, and one in British Columbia and Yukon.

Seven hundred and seventy miles of precise levelling and 26 miles of secondary levelling were added to the Canadian level system, and 391 new bench marks were established.

Ontario

At the request of the Department of Transport a party in charge of D. McMillan ran a line of precise levels along the Rideau River from Ottawa to Smiths Falls, and along provincial highway No. 15, from Smiths Falls to Kingston. The line was planned to follow, as closely as practicable, the course of the Rideau canal. The masonry of locks and the stonework of lock masters' dwellings afforded convenient and enduring structure on which to place bench marks where they are most accessible to the canal engineers. From the main route, branch lines were run to numerous lakes and dam sites in the Rideau chain, and permanent bench marks were placed to provide control levels for future investigations and developments in that locality. One hundred and twenty-nine bench marks were established, 30 of which are in solid rock.

Quebec

On completion of the Rideau canal levelling, the same party moved to Mont Laurier to extend a line of precise levels along the Mont Laurier-Senneterre highway to form a junction with line No. 100 at Senneterre and line No. 140 at Noranda. When completed, this line will provide basic levels in the areas adjacent to hydro reservoirs at the head waters of the Gatineau and Ottawa Rivers. It will also provide level data for geological investigations in that district. By the close of the season levels had been extended to about 70 miles northwest of Mont Laurier, and 36 new bench marks had been established.

Ottawa River and Quebec Bridge

Two levelling programs of a special nature were carried out towards the end of the season.

The first, some three weeks of precise levelling on the Ottawa River was undertaken at the request of the Quebec Hydro-Electric Commission, the purpose being to supply reliable level data for the construction of a storage dam on Rocher Fendu channel situated between Calumet Island and the Ontario shore of the Ottawa River.

The second was a smaller undertaking for the Engineering Department of the Canadian National Railways. Major improvements were projected for the Quebec Bridge and precise level elevations of the two cantilever support piers were supplied through connections to Geodetic bench marks previously established near the bridge.

British Columbia and Yukon

A party in charge of G. S. Raley did some 15 miles of levelling on the Hart highway between Dawson Creek and Prince George. It then extended levels from Dalton Pass to Haines, a distance of 104 miles. This line terminates

upon bench marks of the United States Coast and Geodetic Survey, which are based on sea level as indicated by gauge readings taken in Chilkoat Inlet over a brief period only.

The party then did the precise levelling of some 34 miles over the Carcross cut-off road from the junction with the Alaska Highway at Jakes Corner, via Little Teslin Lake, to Carcross.

Following this the party did the re-levelling of 40 miles along the Alaska Highway from Jakes Corner to the crossing of the White Pass and Yukon Railway; and later, the determination of the elevation of the water of the Lewes River at a number of points, inclusive of a 25-mile line of secondary levels over a difficult route from Takhini to Lake Laberge. Owing to the urgency of the latter task, which was requested by the Special Projects Branch of the Department, it was necessary to limit the re-levelling along the Highway to a single line only.

A total of 181 miles was completed and 70 new bench marks were established.

Saskatchewan and Alberta

A party in charge of L. P. Robertson extended the Geodetic levelling system in Saskatchewan and Alberta to meet the immediate needs of the Prairie Farm Rehabilitation Act of the Department of Agriculture. The main purpose of this levelling was to provide accurate vertical control in districts covered by two proposed irrigation projects, namely, the South Saskatchewan River Project and the Red Deer River project.

Levelling in Saskatchewan consisted of a precise line from bench marks of line Z, at Elbow, to connection with bench marks of line 26, at Chaplin, including a branch to Riverhurst. This work comprised 90 miles of levelling and 42 new bench marks.

In Alberta three precise lines were run, one from Cereal to Hanna by way of Naco and Garden Plain, another from Coronation to Scotfield, and the third from Richdale to Patricia. The total mileage of these lines was 231, and 102 new bench marks were established.

Publications

No. 51.....Altitudes in Southern British Columbia.
No. 23.....Precise and Secondary Levelling in Alberta.

Total Mileage of Levelling in the Canadian Net

Province	Precise	Secondary	Pub. Works	Total
Prince Edward Island	284	.....	.....	284
Nova Scotia	779	.....	309	1,088
New Brunswick	1,106	.....	403	1,509
Quebec	4,065	1,288	1,750	7,103
Ontario	7,267	1,324	2,012	10,604
Manitoba	2,963	368	113	3,444
Saskatchewan	4,203	5,098	.....	9,301
Alberta	3,839	3,799	.....	7,638
British Columbia	5,434	52	.....	5,486
Yukon Territory	1,023	26	.....	1,048
Minnesota, U.S.A.	89	.....	.....	89
Vermont	6	.....	.....	6
New York State	15	.....	.....	15
	31,073	11,955	4,587	47,615

1948—Supplementary Information

Chief of Party	*Mileage*	*Bench Marks*
McMillan, D.	293	177
Raley, G. S.	181	70
Robertson, L. P.	322	144
	796	391

Mileage by Provinces

Ontario	198
Quebec	95
Saskatchewan	91
Alberta	231
British Columbia	15
Yukon Territory	166
	796

Summary

Precise Levelling	*Miles*	*B.M's.*
Prior to 1948	30,304	10,994
Levelling in 1948	770	385
	31,074	11,379
Secondary Levelling		
Prior to 1948	11,929	4,218
1948	26	6
	11,955	4,224
Public Works		
Prior to 1948	4,587	.....
1948	Nil	

Geodetic Astronomy and Isostasy

Field work was carried on in the Yukon, the districts of Keewatin and Franklin, in the Northwest Territories, and in Quebec, Ontario, Manitoba, Saskatchewan and British Columbia. Two Laplace stations were completed, two base lines were measured, 22 astronomic control points for aeronautical charts were established, 13 astronomic stations were observed for the Shoran operations, three astronomic fixations for Loran stations were made, and magnetic data were obtained at 19 points. Computation, compilation and distribution of data relative to this work was completed.

Latitude and Longitude Determinations

Seven parties made observations for the establishment of astronomic control points. One headed by W. D. Forrester located 13 points for the Shoran operations in Manitoba and Saskatchewan. Six parties headed by G. A. Corcoran located 24 points in the districts of Keewatin and Franklin.

These parties took magnetic observations at 19 stations and obtained about 600 descriptive photographs for use of the Geographical Bureau. Several of the northern parties collected botanical, bird life, tidal and archaeological information for interested Government services.

Laplace Determination and Base Lines

W. H. Stilwell determined latitude, longitude and azimuth for Laplace control of triangulation near Teslin in northern British Columbia, and at Ashuanipi Lake in Labrador. He also measured a base line at each of these locations.

Legal Surveys Division

The Division makes legal surveys of Dominion and other lands owned or administered by the Federal Government; prepares and maintains aeronautical charts and flight manuals; prepares electoral maps; and maintains a central office for recording and indexing survey returns and plans, and a central office for distributing maps and aeronautical charts.

Ten parties were engaged in legal survey field work in Yukon and Northwest Territories; four in making topographical plans of the Columbia River Basin; and one sub-dividing Indian lands in Ontario.

In the development of a method of obtaining ground profiles by radar altimeter for the purpose of contouring aeronautical charts, an extended program gave satisfactory results over an area of about 80,000 square miles.

The planimetry of an area of about 274,000 square miles was plotted from tri-camera and vertical photographs for inclusion in aeronautical charts and other purposes.

Preparation of 293 Federal electoral district maps, including Newfoundland, was completed.

Map distribution showed an increase of about 50 per cent over the previous fiscal year owing largely to the distribution of 100,000 electoral maps, and to the increase in the demand for maps by the Armed Services.

Legal Surveys Section

Northwest Territories

Two field parties extended the system of governing surveys adopted in 1944 as control for such cadastral surveys as may be required in the Northwest Territories. They surveyed 161 miles of line in accordance with the provisions of the Dominion Lands Surveys Act, and thus completed a total of 500 miles of connected control survey, chiefly along township outlines, between Windy Bay on Great Slave Lake and a point about 90 miles below Fort Wrigley on Mackenzie River. The westerly branch of this control was being extended to the oil field at Norman Wells and the easterly branch to the Yellowknife gold mining area.

One of the survey parties sub-divided 86 additional lots at Hay River Settlement and surveyed a school site at Fort Smith.

Yukon

One field party established control, one was on miscellaneous legal surveys and the third surveyed 56 mineral claims.

The control consisted of two lines of semi-precise traverse, the first of 120 miles along the Whitehorse-Dawson road, extending northerly from a point about 10 miles south of Braeburn, and the second of 30 miles along the Whitehorse-Carcross road, extending southerly from the Alaska Highway.

The miscellaneous work comprised surveys at Robinson Station, Ross River, Tagish, Whitehorse, Mayo, and a survey of the Experimental Agricultural Sub-Station operated by the Dominion Department of Agriculture at mile 1,019 on the Alaska Highway.

The survey of the right-of-way of the Galena Hill road was extended for 1¾ miles for control purposes.

The sub-division of Teslin Settlement was completed and cemetery and school sites were laid out.

British Columbia

The east boundary of Upper Sumas Indian Reserve was re-established.

A site for a residential school was surveyed in Alert Bay Indian Reserve.

The boundaries of Saughanault Indian Reserve No. 28 were retraced.

A surrendered portion of Hazleton Indian Reserve No. 1, and an addition to this reserve were sub-divided.

Yukon-British Columbia Boundary Survey

Under the direction of the British Columbia-Yukon Boundary Commission, 36 miles of the 60th parallel of north latitude between approximate longitudes 129°03′ and 130°05′ were finally determined and monumented. This work is in territory adjacent to the Alaska Highway.

Alberta

A retracement survey was made of Lots 1 to 7, comprising the Alberta portion of Fort Smith Settlement, and an original survey was made of a power transmission line passing through these lots.

Lot 15 at Fort Fitzgerald Settlement was sub-divided.

At Fort MacMurray, the boundaries of Lots 8, 9, 10 and 11 were retraced.

The east, west, and south boundaries of a recent addition to Elk Island National Park were retraced.

Saskatchewan

Twenty thousand four hundred and eighty acres in the surrendered portion of Okemasis and Beardy Indian Reserve were sub-divided into sections and quarter-sections in accordance with the first system of Dominion Lands surveys.

Ontario-Manitoba Boundary Commission Survey

Orders in Council relating to the Ontario-Manitoba Boundary survey were prepared for presentation to the Ontario and Manitoba Governments, accepting the line as surveyed as the true boundary.

Ontario

A timber lease was surveyed in the surrendered portion of Nipissing Indian Reserve No. 10.

On Factory Island in the estuary of Moose River on James Bay, lots were laid out for church and hospital sites, and the boundaries were run between Indian reserve land and land owned by Hudson Bay Company.

In the surrendered portion of Saugeen Indian Reserve, a strip of land extending 5½ miles along the shore of Lake Huron was surveyed and sub-divided into 347 lots to be leased to summer residents. Seven miles of the east boundary of the reserve were retraced.

The west limit of Lot 10, concession 12, Tehkummah township was retraced.

A parcel of land was surveyed for leasing purposes on Whitefish Indian Reserve.

On Manitoulin Indian Reserve, 5,000 acres were sub-divided into farms. Roads were laid out and a school site was surveyed.

Six parcels of Ordnance land were surveyed, one at Queenston, three at Kingston Mills, one at Brewers Mills, and one at Jones Falls.

At Stoney Creek, a survey was made of a parcel of land required as a historic site.

Preliminary surveys were made on three islands in the St. Lawrence River belonging to St. Regis Indian Reserve. The islands are to be sub-divided into lots for lease to summer residents.

Quebec

The dividing line between Pierreville Indian Reserve and Lot 911 was established.

Aeronautical Chart Section

This Section prepares the material necessary for the construction of all aeronautical charts required for civil and military purposes and for supplying supplementary air information.

Air Photogrammetry

16-Mile National Topographic Series No.	*Area Plotted Square Miles*
13	8,400
25	33,265
26	19,500
35	24,800
36	5,546
37	11,136
42	8,300
53	44,328
54	27,037
64	47,725
65	32,979
74	3,200
Total	266,216
Winnipeg Airport	941
Indian Reserves	62
Forestry Maps	6,638
Total plotted	273,857

Ten operational maps were compiled for trimetrogon air photography to be done by the R.C.A.F. in 1949. These complete coverage of Canada up to latitude 74°30' and take care of all the major gaps in previous photography.

Air Information and Canada Air Pilot

Field work was confined to the revision of the N.W. quarter of the Toronto-Ottawa 8-mile aeronautical chart and to the incidental collection of data of value for revision of the four included 2-mile sheets of the National Topographical Series, namely, Muskoka, Sundridge, Byng Inlet, and Parry Sound.

Air information on 105 of the 221 charts which comprise the 8-mile series is now shown by International Civil Aviation Organization symbols. Canada has accepted responsibility for the production of the 65 charts of the 1:1,000,000 ICAO series which cover the Dominion. Two of these are printed and 38 are in various stages of preparation.

An experimental grid navigation chart of southeastern Canada was prepared at the request of the R.C.A.F. to enable them to give, in the more accessible southerly regions, instruction in flying essential for air navigation in the Arctic and sub-Arctic regions. It is drawn on a polar stereographic projection at a scale of 30 nautical miles to 1 inch along the 50th standard parallel, and covers about 16° in latitude and 17° in longitude. The principal innovations are a series of straight grid lines 3 inches apart drawn parallel to the Greenwich meridian, and the addition of "isogrivs" (isogonals referred to Greenwich meridian). By the application of simple mathematical formulae it is possible to convert the true course to the grid course and the grid course to the magnetic course. The primary purpose of grid navigation is to overcome the difficulties in polar and sub-polar air navigation resulting from congestion of the isogonals due to their convergence at the North Magnetic Pole.

At the request of the R.C.A.F., the 30-nautical-mile chart of the Canadian Arctic is under revision on the basis of a modified Lambert conformal projection devised by an officer of the Geodetic Survey. This is generally accepted as being the best chart aid to polar air navigation.

The Canada Air Pilot is published in an Eastern and Western Volume and comprises an edited compilation of publications issued under authority of the Department of Transport. Amendments in stencil form are issued fortnightly to subscribers. During the year, 424 pages were revised and 6 pages concerning new airfields were compiled. Twenty-five radio facility charts were revised

and issued with amendment lists. It is the intention to replace the aerodrome pages in the Canada Air Pilot with approach and landing charts in all cases where instrument landing systems are installed. They will conform to ICAO specifications. An approach and landing chart for Dorval airport at Montreal was published.

Further progress was made in experimental work to obtain ground profiles by using the radar altimeter in a plane in level flight. A more ambitious program, designated "Operation Radalt" was undertaken. In 160 hours of flying, 14,000 miles of ground profiles were recorded over an area comprising the major portions of the three 8-mile sheets, Toronto-Ottawa, Upper Ottawa River, and Hearst-Cochrane. The R.C.A.F. and the National Research Council are co-operating in this work. The latter developed a device whereby linear motions of a sensitive pressure capsule caused by deviations from constant pressure altitude are converted to relative electric values and are incorporated in the ground profile record, thus automatically compensating for deviations caused by fluctuating pressure altitudes. Tests during "Operation Radalt" indicate the possibility of extensive radar levelling with only a few control elevations.

Columbia River Basin Project

The four field parties on this project ran 183 miles of traverse. The project will be covered by 75 large scale map sheets of which 11 have been published.

Survey Records and Electoral Maps

Electoral Maps

By authority of the Representation Act, 1947, a new set of electoral maps was prepared consisting of: a map of each of the 253 Dominion electoral districts; a map of each province (two sheets for Ontario); a map of the 10 cities, having portions in more than one electoral district; and a map of the 10 cities with populations of over 30,000 that are wholly within an electoral district. For the convenience of political organizations and Government departments, the set was put up in five volumes.

On instructions from the Chief Electoral Officer, 250 copies were prepared of both the volumes of Ontario and Quebec maps, and 200 copies of each of the three volumes containing maps of the other seven provinces.

As required by the Dominion Elections Act, a volume of key maps was prepared and 900 copies printed. This volume is comprised of maps of all constituencies in cities which form part of more than one electoral district. It will be used by Returning Officers in ascertaining the electoral district in which members of the Defence Forces and certain war veterans are entitled to vote.

A set of nine electoral maps of Newfoundland was ready for release when the agreement of union of Newfoundland with Canada was ratified. The set consists of a map of the Province showing the electoral districts, a map of the city of St. John's, and a map of each of the seven electoral districts.

Map Distribution Section

In accordance with an agreement between the Dominion and Saskatchewan Governments, 66 record books of Dominion Lands Surveys affecting Saskatchewan were transferred to that Province.

The following material was distributed: National Topographic Series maps, 178,479; National Topographic Series maps published by the Army Survey Establishment, R.C.E., 64,004; aeronautical charts, 88,882; old Geographic series, 5,114; miscellaneous maps, 152,815; sectional maps, 36,097; forestry maps, 1,508; electoral district maps, 101,702; official plans, 16,857; publications, 4,955; Canada Air Pilot, books, 191; Canada Air Pilot, amendments, 22,011; and Canada Air Pilot, sheets, 8,672.

Board of Examiners for Dominion Land Surveyors

The Board held one meeting, the regular annual meeting called for by Section 9 of the Dominion Lands Surveys Act. During this meeting, examinations were held at Ottawa, Winnipeg, Saskatoon, Edmonton, and Vancouver. Eighteen of the 43 candidates were successful in the preliminary examination, five of the six candidates were successful in the final examination, and one candidate was successful in the examination for Dominion Topographical Surveyors. Two commissions were issued to candidates who had passed the final examination and had furnished oaths of office and allegiance, and bond for the sum of $1,000, as required by Section 25 of the Dominion Lands Surveys Act. Fifteen certificates of preliminary examination were issued to successful candidates who had complied with the requirements of the Act. One certificate was issued to the candidate who had passed the examination for Dominion Topographical Surveyors.

Six Dominion standard measures of length were issued to Dominion and Provincial land surveyors.

Map Compilation and Reproduction Division

The chief function of the Division is the production of maps and charts of a wide variety in type and scale, to cover Canada. This involves the compilation, draughting, and reproduction by photo-lithography in multi-colour of maps for public distribution. There is also a service to Government departments for photographic reproductions, photostats, and black line and blue line printing.

The great increase in demand for maps shows an awakening of the public's map interest. This interest has been more strongly stressed in the demand for those maps covering the summer playgrounds of the nation and is reflected in map quantities required far in excess of former estimates. In the case of some maps, five times the pre-war quantities are being requested, which means more frequent revision and printing.

Unmapped areas in Canada's northland are constantly being filled in as the vast program of aerial photography unfolds, and new planimetry becomes available. Railways, roads, and bridges are being constructed. A mine is opened and a new townsite is laid out in the area. A dam and power-house is built, and a new lake is created with an electric power line stretching from the site to the nearest city. All information of this nature along with the most recent maps from other publishing organizations is carefully catalogued and filed in the comprehensive map library maintained by the Division.

New maps were produced to comply with a wide variety of demands. The Redistribution Act of 1947 created changes in the boundaries of the Electoral Districts and for the first time the new electoral maps were issued as lithographic prints in two colours instead of the former blue prints, a change which has evoked much favourable comment. To investigate the possibility of a more advantageous use of the water of the Columbia River System, field parties from the Legal Surveys Division and the Dominion Water and Power Bureau made detailed topographic surveys in this area. This marked the beginning of a new series of large scale topographical plans which was put into production during the year. The new series of World Aeronautical Charts on the scale of 1:1,000,000, drawn to specifications laid down by the International Civil Aviation Organization, to cover all of Canada also went into production.

Compilation Section

The eight-mile maps of the National Topographic series form the only map series completely covering Canada at the same scale. The revision of this group is geared to keep pace with new planimetry from aerial photographs and

usually involves redraughting the original drawings. Topography from this source was incorporated in the revision of 21 of the 24 sheets on this scale revised during the year. One new sheet in the vicinity of Lake Superior was compiled to complete the series.

For the large scale maps of the National Topographic Series, and for the Sectional Map Series, the preparation of a new plate to show highways and secondary roads and an overprint plate to show corrections in black, such as trails and place names, has been found the most practical method of revision. Corrections to the remainder of the plates can generally be done directly on the zinc plates by draughtsmen of the Lithographic Section. Field returns provided the basis for revision by this method of nine, one- and two-mile maps of the National Topographic Series in southwestern Quebec. Ten other large scale maps of the National Topographic Series and three Sectional sheets were revised with information from a variety of sources.

World aeronautical charts provide coverage of the land areas of the world on a scale of 1:1,000,000. Of the 65 Canadian sheets required, 27 were compiled and 10 were in hand.

Compilation was completed for the remainder of the electoral maps required under the Redistribution Act. All base maps are printed in black, and electoral district boundaries are shown by a transparent red overprint, an improvement over the former method of using blue prints.

Air navigation in Canada's northern regions has long been complicated by the wide range in compass declination. To provide a better navigational chart, the R.C.A.F. devised a method of grid navigation, which makes use of plotted "isogriv" lines to obtain corrected compass readings. For purposes of training in the use of this method, a grid navigation plotting chart covering southeastern Canada was compiled. This chart is on a polar stereographic projection on a scale of 30 miles to an inch. Grid lines are shown in red, spaced three inches apart, and parallel to the Greenwich meridian. Isogrivs are plotted in broken red line at intervals of four degrees.

Thirteen base maps covering Canada and provinces were compiled for a new Canada Descriptive Atlas in hand with the Department. With each base map, two plastic overlays were prepared, one to show natural resources, and the other covering French translations of titles, etc. Other miscellaneous maps compiled include the revision of a map showing highways through National Parks in Alberta and British Columbia, the revision of a map of Canada showing forest classification, for Dominion Forest Service, and four of a series of maps of Canadian provinces for the Department of Veterans Affairs.

Investigation and compilation of names was completed for 110 topographic maps and aeronautical charts and 32 hydrographic charts. In excess of 14,000 names were checked, tabulated and forwarded to the Canadian Board on Geographic Names before being passed to the Draughting Section. About ten per cent of these were name changes selected in co-operation with provincial authorities, to eliminate hackneyed and unsuitable designations.

Summary

	Scale	*First Editions*	*Revised Editions*
Standard aeronautical charts	8 mi.	1	8
Prelim. " "	8 "	—	16
National Topographic Series	4 "	—	4
" " "	2 "	—	8
" " "	1 "	—	4
Sectional maps	3 "	—	3
World aeronautical charts	1:1,000,000	13	—
Electoral maps	—	67	—
Columbia River Basin series	—	2	—
Miscellaneous maps	—	27	—

Computing Section

Computations for azimuthal equidistant projections of the world requested by the Department of National Defence (Navy) for charts with poles at Coverdale, Gloucester, Boundary Bay, and Whitehorse were completed.

Draughting Section

Maps, charts and diagrams for other governmental organizations not having draughting facilities were drawn and prepared in this Section for photographic reproduction.

Statistics of new or revised drawings completed, checked, and passed to the Photo-Mechanical Section for reproduction are:

	Scale	*No.*
Standard aeronautical charts	8 mi.	4
Preliminary " "	8 "	11
National Topographic series	4 "	5
" " "	2 "	8
" " "	1 "	2
Sectional maps	3 "	6
World aeronautical charts	1:1,000,000	5
Electoral maps	—	92
Columbia River Basin maps	½ mi.	3
Index maps	—	7
Descriptive Atlas of Canada	—	13
Miscellaneous maps	—	28

Photo-Mechanical Section

This section photographs the drawings and prepares wet plate and film negatives from which photo-litho plates and chemical offsets are prepared on metal for the Lithographic Section. Charts are photographed and processed for the Canadian Hydrographic Service. The section handles an increasing volume of photography, processing, and print work for other governmental Departments. During the fiscal year facilities and equipment for the processing of infra red plates were installed, and approximately 3,000 plates exposed by the Topographical Survey were indexed, developed, and enlarged. A small developer was installed to provide black line prints.

All phases of photo printing increased. The amount of vandyke printing increased by 127 per cent, blue printing by 23 per cent, and photostat work by 8 per cent.

Summary

Photo Processing	
Wet plate negatives	826
Film negatives	1,954
Photo-lithographic plates	970
Photography	
Infra red (plates developed)	2,995
Infra red (enlargements)	2,769
Bromide prints	473
Velox prints	3,078
Photostat (sheets)	15,733
Contact and Blue Printing	
Blue printing (square feet)	259,379
Vandyke printing (square feet)	7,507
Vandyke prints	4,582
OCE prints	1,339

42516—8½

Lithographic Section

New Maps

Among the new maps printed, special mention should be made of the 11 large-scale maps of the Columbia River Basin Series, each requiring five colours in accurate registration; a new four-mile map of the National Topographic Series in eight colours, designed to replace the Brandon and Manitoba House Sectional sheets; the first published sheet of the Canadian Series of the World Aeronautical Charts in seven colours, to conform with I.C.A.O. specifications; a new map of Manitoba south in four colours; and 134 electoral maps.

Revision Maps

Extensive plate corrections were made for 22 maps.

Reprints

Almost half of the reprint work concerned eight-mile sheets for use as bases for aeronautical charts. Two extensive reprints of the 100-mile map of Canada were necessary. Also reprinted were six four-mile maps, three two-mile maps and two one-mile maps of the National Topographic Series, and seven three-mile Sectional sheets. Among the miscellaneous maps reprinted were two sheets of the old Chief Geographer's Series, the eighty-mile map of the N.W.T. and Yukon, the thirty-five-mile map of Alberta, the six-mile map of Great Slave Lake, and 25,000 copies of the hundred-mile Natural Resources Map of Canada.

Proof Copies

A total of 1,531 proof copies for 276 maps was turned out by the proofing presses. In addition, 800 black and blue line impressions were pulled, of which 132 blue line prints were mounted on metal for office use.

Summary of Printing

A total of 874,655 maps and charts were printed. The number of printing impressions required to produce these copies in the requisite number of colours was 3,379,175.

Maps and charts prepared by other Divisions and printed by this Section include 11 maps showing forest classification for Dominion Forest Service, 103 charts for Hydrographic Survey, and 28 radio facilities charts for the Aeronautical Chart Section of Legal Surveys.

Overprints showing aeronautical information in magenta were made on 107 maps of the eight-mile National Topographic Series and one World Aeronautical Chart.

Details of Printing

	Maps Published	Total Copies
New maps printed	190	332,895
Maps revised	72	199,085
Maps reprinted	66	224,060
Hydrographic charts	103	112,255
Miscellaneous	12	6,360
Total	443	874,655

LIST OF NEW OR REVISED MAPS

PRINTED BY MAP COMPILATION AND REPRODUCTION DIVISION

FISCAL YEAR 1948-1949

(I) Aeronautical Charts—National Topographic Series

Location	Number	Name	Scale	Latitude	Longitude	Remarks
Labrador	14 NW	Hebron-Cape Territok	8 mi.	58° 00′ to 60° 00′	60° 00′ to 65° 00′	Prelim. Edn.-Revision
Quebec-Newfoundland	12 NE	Harrington-Belle Isle	8 "	50° 00′ " 52° 00′	55° 15′ " 60° 00′	" "
Quebec-Ontario	32 NW	Rupert House	8 "	50° 00′ " 52° 00′	76° 00′ " 80° 00′	" "
Ontario-Quebec	31 SE	Ottawa-Montreal	8 "	44° 00′ " 46° 00′	72° 00′ " 76° 00′	Stand. Edn.-Revision
Ontario	43 NW	Winisk River	8 "	54° 00′ " 56° 00′	84° 00′ " 88° 00′	Prelim. Edn.-Revision
Ontario-Northwest Territories	43 SE	Akimiski Island	8 "	52° 00′ " 54° 00′	80° 00′ " 84° 00′	" "
Ontario-Manitoba	52 SW	Kenora-Fort Frances	8 "	48° 00′ " 50° 00′	92° 00′ " 96° 00′	Standard Edn.-Revision
Manitoba-Ontario	53 NW	Gods Lake	8 "	54° 00′ " 56° 00′	92° 00′ " 96° 00′	" "
Manitoba	64 SE	Southern Indian	8 "	56° 00′ " 58° 00′	96° 00′ " 100° 00′	Prelim. Edn.-Revision
Manitoba-Saskatchewan	64 SW	Reindeer Lake	8 "	56° 00′ " 58° 00′	100° 00′ " 104° 00′	" "
British Columbia	93 SW	Ocean Falls-Ootsa Lake	8 "	52° 00′ " 54° 00′	124° 00′ " 128° 00′	Standard Edn.-Revision
British Columbia	103 SE	Queen Charlotte Is.-Bella Bella	8 "	52° 00′ " 54° 00′	128° 00′ " 133° 00′	" "
Northwest Territories	67 SE, SW	King William Island	8 "	68° 00′ " 70° 00′	96° 00′ " 104° 00′	Prelim. Edn.-Revision
Northwest Territories	75 SE	Wholdaia Lake	8 "	60° 00′ " 62° 00′	104° 00′ " 108° 00′	" "

(ii) Other National Topographic Series Maps

Location	Number	Name	Scale	Latitude	Longitude	Remarks
Nova Scotia	11 E/10	New Glasgow	1 mi.	45° 30′ " 45° 45′	62° 30′ " 63° 00′	Revision
Nova Scotia	20 O/16	Yarmouth	1 "	43° 45′ " 44° 00′	66° 00′ " 66° 30′	"
Quebec	31 J/NW	Mont Laurier	2 "	46° 30′ " 47° 00′	75° 00′ " 76° 00′	"
Quebec	31 O/NE	Parent	2 "	47° 30′ " 48° 00′	74° 00′ " 75° 00′	"
Quebec	31 N/NE	Vimy	2 "	47° 30′ " 48° 00′	76° 00′ " 77° 00′	"
Quebec-Ontario	31 G/NE	Lachute	2 "	45° 30′ " 46° 00′	74° 00′ " 75° 00′	"
Quebec-Ontario	32 D/SW	Rouyn-Larder Lake	2 "	48° 00′ " 48° 30′	79° 00′ " 80° 00′	"
Ontario	52 H	Nipigon	4 "	49° 00′ " 50° 00′	88° 00′ " 90° 00′	"
Ontario	52 C	Rainy Lake	4 "	48° 00′ " 49° 00′	92° 00′ " 94° 00′	"
Manitoba-Ontario	52 L	Pointe du Bois	4 "	50° 00′ " 51° 00′	94° 00′ " 96° 00′	"
Manitoba	62 G	Brandon	4 "	49° 00′ " 50° 00′	98° 00′ " 100° 00′	First Edition
Saskatchewan-Manitoba	63 K	Cormorant Lake	4 "	54° 00′ " 55° 00′	100°00′ " 102° 00′	Revision
Alberta-British Columbia	82 N/8	Lake Louise	1 "	51° 15′ " 51° 30′	116° 00′ " 116° 30′	"
British Columbia	92 I/NE	Kamloops Lake	2 "	50° 30′ " 51° 00′	120° 00′ " 121° 00′	"

(iii) Sectional Maps

Saskatchewan	167	Kindersley	3 mi.	51° 06′ to 51° 48′	108° 05′ to 110° 00′	Revision
Saskatchewan	268	Carlton	3 "	52° 29′ " 53° 12′	106° 00′ " 108° 03′	"
Alberta	115	Blackfoot	3 "	50° 24′ " 51° 06′	112° 04′ " 114° 00′	"
Alberta	264	Brazeau	3 "	52° 29′ " 53° 12′	113° 59′ " 116° 03′	"
Alberta	265	Peace Hills	3 "	52° 29′ " 53° 12′	112° 01′ " 114° 00′	"
Alberta	364	Fort Assiniboine	3 "	53° 53′ " 54° 36′	114° 00′ " 116° 07′	"
Alberta	365	Victoria	3 "	53° 53′ " 54° 36′	112° 05′ " 114° 00′	"
Alberta	415	Tawatinaw	3 "	54° 34′ " 55° 18′	111° 57′ " 114° 01′	"
Alberta	513	Shaftesbury	3 "	55° 59′ " 56° 41′	116° 02′ " 118° 00′	"

(iv) World Aeronautical Charts

Nova Scotia, Prince Edward Island, Newfoundland	2261	St. Marys River	1:1,000,000	44° 00′ to 48° 00′	56° 00′ to 64° 00′	First Edition

(v) Columbia River Basin Maps

British Columbia	M.S. 1	Kootenay River-Creston Area	1:12,000	49° 00′ to 49° 03′	116° 30′ to 116° 35′	First Edition
British Columbia	M.S. 2	" "	"	49° 03′ " 49° 06′	116° 30′ " 116° 36′	"
British Columbia	M.S. 3	" "	"	49° 05′ " 49° 08′	116° 31′ " 116° 38′	"
British Columbia	M.S. 4	" "	"	49° 08′ " 49° 11′	116° 32′ " 116° 39′	"
British Columbia	M.S. 5	" "	"	49° 11′ " 49° 14′	116° 34′ " 116° 41′	"
British Columbia	M.S. 6	" "	"	49° 14′ " 49° 18′	116° 35′ " 116° 42′	"
British Columbia	M.S. 7	Kootenay River-Kootenay Lake Area	1:31,680	49° 15′ " 49° 25′	116° 38′ " 116° 51′	"
British Columbia	M.S. 8	" "	"	49° 25′ " 49° 35′	116° 43′ " 116° 56′	"
British Columbia	M.S. 9	" "	"	49° 35′ " 49° 43′	116° 46′ " 117° 03′	"
British Columbia	M.S. 10	" "	"	49° 27′ " 49° 38′	117° 01′ " 117° 29′	"
British Columbia	M.S. 11	" "	"	49° 43′ " 50° 07′	116° 50′ " 116° 57′	"

(vi) Park Maps

Saskatchewan		Prince Albert Park	1:150,000	53° 33′ to 54° 20′	105° 32′ to 106° 45′	Revision

(vii) North America (Plotting Series) Charts

British Columbia	NW 48/130	Vancouver	1:1,000,000	48° 00′ to 55° 00′	115° 00′ to 130° 00′	Revision

(viii) Miscellaneous Maps

Manitoba		Manitoba South	16 mi.	49° 00′ to 54° 25′	91° 45′ to 101° 25′	First Edition-for Prov of Manitoba.
Northwestern Canada		Canada's Western Arctic	120 mi.	65° 00′ " 77° 00′	90° 00′ " 140° 00′	For Canada Year Book
Northwestern Canada		Investigation of Barren Ground Caribou	64 mi.	53° 00′ " 72° 00′	80° 00′ " 143° 00′	For Dominion Wildlife Service.
Canada		Geodetic Field Operations	100 mi.	42° 00′ " 75° 00′	50° 00′ " 150° 00′	For Geodetic Survey

Dominion Water and Power Bureau

The primary function of the Bureau is the acquisition, analysis, and publication of stream-flow and run-off data covering the whole Dominion. These basic data are used in connection with power development, storage, irrigation, drainage, flood warnings, flood control, navigation, domestic water supply, and various international water problems. The Bureau is the central repository for hydrometric and water-power information acquired from all available sources. It maintains gauging stations and makes hydrometric investigations in all provinces in accordance with co-operative agreements under which the provinces contribute funds for its support. It administers the water-power regulations on Crown lands and in the Yukon and Northwest Territories, and is actively concerned with international waterway problems. Its engineers serve on numerous boards and engineering committees and as technical advisers to the Department of External Affairs and to the International Joint Commission, in which work special investigations and studies are made by the Bureau as required.

Close co-operation is maintained with Federal, Provincial, and municipal authorities in power and water-supply problems. Stream-flow data and assistance in hydraulic matters are furnished to many private companies which frequently reciprocate by supplying the Bureau with gauge records. Close relations exist with the Water Resources Branch of the United States Geological Survey in the operation of international gauging stations and in the exchange of stream-flow data.

During the year under review, special investigations were made in connection with the Columbia River surveys, floods in British Columbia and on the Prairies, problems involving prairie rivers, and the Snare River Power Project.

Hydro-electric development throughout the Dominion proceeded actively. Installed capacity was increased by 440,095 horse-power and plants under construction will have an ultimate capacity of about 1,000,000 horse-power.

Dominion Hydrometric Service

To facilitate hydrometric field operations, district offices are maintained in Vancouver, Calgary, Winnipeg, Ottawa, Montreal, and Halifax, and sub-offices at Kamloops, Nelson, Whitehorse, Keewatin, North Bay, and Niagara Falls. A current-meter rating station is operated at Calgary for the calibration and repair of meters and for experimental purposes, its services being available to other organizations.

Stream Gauging

Field operations were expanded with the establishment of 16 new stream-gauging stations and the re-establishment of 10 others. More than 1,000 stations were maintained, many of them continuously by use of the recording gauges. More than 3,400 stream-discharge measurements and 2,200 inspections of gauging stations were made. During the open-water season, about 400 part-time observers are employed as gauge readers directly by the Bureau and of these some 275 serve throughout the year. About an equal number are supplied by various co-operating agencies.

In British Columbia, 250 gauging stations were maintained throughout the year and about 400, including six in the Yukon, during the open-water season. Additional recording gauges and metering stations were established on the principal tributaries of the Kootenay and Columbia Rivers in connection with the international Columbia Basin studies. Special hydrometric work was occasioned by the floods in May and June and by the co-operative programs with Federal and Provincial agencies.

The Calgary office maintains 200 stations, six of which are in the Northwest Territories. Investigations receiving special attention included power and storage in the upper Bow River basin, the flow of international streams at the border, spring floods, and ice conditions on the Bow River at Calgary. The current-meter rating station was in operation from May to October, and 76 meters were rated and 50 repaired.

The Winnipeg office maintained 119 stations and was especially concerned with floods in Manitoba and Saskatchewan, regulation of Lake of the Woods, and international prairie rivers.

The Ontario district office maintains 144 gauging stations. It co-operated closely with the Hydro-Electric Power Commission of Ontario and the Ontario Department of Planning and Development. It made special studies on the Thames, Grand, South Nation, and Niagara Rivers.

The Quebec office with 157 gauging stations co-operated with the Quebec Streams Commission and the power-producing organizations in the Province. Special work included the rating of the outflow of storage reservoirs and extending hydrometric operations to include rivers on the north shore of the Gulf of St. Lawrence.

The Halifax office operates 22 regular stations throughout New Brunswick and Nova Scotia. It co-operates with the New Brunswick Electric Power Commission, the Nova Scotia Power Commission, and private power companies. Arrangements were being completed to extend the territory served by the Halifax office to include Newfoundland.

Run-Off Conditions in Canada

Extreme variations were experienced in some areas at certain seasons, but total run-off was slightly above normal, the average for 23 rivers across the country being 103 per cent of the long-term mean.

In British Columbia, low flows in April 1948, were followed by extreme floods in May and June which caused extensive damage in the Fraser and Columbia River valleys. River flows were approximately normal during summer and autumn but were deficient in January and February, causing a temporary power shortage in Vancouver.

In Alberta and western Saskatchewan, run-off was much above normal in April, May, and June and nearly normal the remainder of the year.

In Manitoba and eastern Saskatchewan run-off was almost twice normal. Extreme high water was experienced in April and May on the Souris, Assiniboine, Red Rivers and their tributaries and in May and June on the Saskatchewan River. Later months were close to normal except for low flows in March.

In northwestern Ontario, total run-off was slightly sub-normal. In central Ontario, the year's run-off averaged 91 per cent of the long-term mean for four typical rivers. In September, discharges were close to record lows for that month.

In Quebec, deficient run-offs predominated over most of the Province for most of the year and were critical in October, especially in the southern part of the Province. The average for the year on four typical rivers was 77 per cent of normal.

Over most of the Maritime Provinces, total run-off was slightly above normal.

Snow Surveys

Annual snow surveys are made on selected typical courses in certain important drainage basins to estimate the amount of spring run-off that will result from the accumulated snow, and to determine the water content of the snow cover. The date of each survey is the same each year but varies with the district.

In British Columbia, a co-operative program is carried out with Provincial authorities, the Bureau maintaining seven courses, three in the Coastal area, and four in the upper Columbia basin. Surveys are made in January, February, and March, the results in 1948-49 showing snow in excess of normal.

The Calgary office co-operates with the United States Geological Survey on surveys in the St. Mary River basin in early May and makes an independent survey in the Bow River basin in late March.

In the Winnipeg River watershed, the Bureau carries out six surveys which form part of a co-operative program with the United States Corps of Engineers and the Hydro-Electric Power Commission of Ontario. These surveys in 1948-49 showed nearly normal amounts of snow. Six surveys in the northern sector of central Ontario showed slightly below normal snow cover.

In the Maritimes, three regular surveys are made in New Brunswick and others in Nova Scotia when there is snow to measure.

Glacier Surveys

Seven glaciers were under study in British Columbia and five in Alberta. Further recession of the tongues of all glaciers was reported, averaging 124 feet in the Coast Range, 60 feet in the Selkirks, and 116 feet in the Rocky Mountain Range. In the Coast Range, two observations of the yearly rate of ice flow averaged seven feet, and the average rate for four glaciers in the Rocky Mountain Range was 50 feet. The observed glacier run-off varied from 10 to 128 second-feet. More precise records will be available for the typical Athabasca Glacier next season as a new gauging station, equipped with a recording gauge, has been established on the Sunwapta River.

Flood Warning Service

As the observation of river levels is a continuous function of the Bureau, a flood-warning service is provided as required on certain rivers subject to dangerous flooding. In the extreme flood conditions on the Fraser and Columbia Rivers in May and June 1948, a particularly valuable service was rendered by the Vancouver office which became the centre of all information with respect to river levels throughout the Province. Excellent co-operation was received from all interested agencies and all information received was correlated with recorded gauge heights at key stations to forecast river rises. A similar service was given in Manitoba by the Winnipeg office at the time of the severe spring floods on prairie rivers.

Regulation of Lake of the Woods and Lac Seul

Under the authority of the Lake of the Woods Control Board, the regulation of Lake of the Woods was continued, an engineer being stationed at Keewatin. The spring run-off of the watershed was above normal but the yearly run-off was only 85 per cent of the long-term mean, October being a particularly low month. The lake level rose from elevation 1,059·72 feet on April 1, to a peak of 1,061·26 feet on May 7. During the period April 30 to June 11, the lake level was above 1,061 feet and its regulation was subject to the approval of the International Control Board. Wasting of water was begun on April 30 and was continued at varying rates up to the maximum obtained by opening

all gates on May 11. The gates were partly closed on May 15 and spilling of lesser proportions was continued until June 14 when all auxiliary gates were closed. Subsequently the discharge was regulated, principally to provide for the equitable requirements of the power plants at the lake outlets and on the Winnipeg River. By March 31, the level of the lake was drawn down to 1,057·65 feet, somewhat below usual storage levels.

The regulation of Lac Seul, under the supervision of the Lake of the Woods Control Board, was carried out by the Hydro-Electric Power Commission of Ontario. The total run-off for the watershed averaged 82 per cent of the long-term mean. The spring run-off was above normal but September, October, and November were particularly low months. The lake level, at elevation 1,166·85 on April 1, rose to a peak of 1,171·83 by August 21 and was drawn down to 1,165·45 feet by March 31. Water was spilled up to a maximum rate of 10,500 second-feet during the period August 20 to September 17 to hold the lake within storage limits, and during the period October 12 to February 23 at rates varying up to 4,500 second-feet to supplement the flow of the Winnipeg River in Manitoba.

The Water-Power Resources of Canada

The estimate in 1948-49 shows resources of 40,124,000 h.p. at ordinary six-months flow, which will enable an economic installation of about 52,000,000 h.p. On the basis of ordinary minimum flow, the estimate is 25,723,000 h.p. New hydraulic installations totalled 440,095 h.p. bringing the installed capacity of all water-power plants in Canada to 10,870,718 h.p. of which central electric stations comprise over 91 per cent.

Water Resources Monthly Review

The Bureau co-operates with the United States Geological Survey by supplying data for the monthly summary of general stream-flow conditions in the United States and Canada, issued by the Survey. The flow records of 22 typical rivers well-distributed across the Dominion are computed immediately at the end of each month, each District Office providing data for the rivers in its territory. These data are transmitted by airmail to Washington where they are combined with those for the United States. The information in bulletin form is made available promptly to the general public. Semi-annual and annual summaries also are issued.

International Waterway Problems

A number of International Engineering Boards, Committees, and Boards of Control have been set up from time to time, either jointly by the Governments of Canada and the United States, or by the International Joint Commission. During the year the Bureau was directly concerned with many of these engineering bodies as outlined below.

Columbia River Engineering Board

As requested by the International Joint Commission under the reference of March 9, 1944, the Canadian Sections of the International Columbia River Engineering Board and Committee, under the chairmanship of the Controller, continued studies of the further uses of the water resources of Columbia River basin in Canada and consulted with similarly functioning United States bodies in planning the most advantageous joint utilization of these resources. The investigations are conducted in the interests of irrigation, water power, flood control, reclamation, navigation, domestic water supply, sanitation, conservation of fish and wild life, and other beneficial purposes.

Osoyoos Lake

The International Control Board, of which a Bureau engineer is a member, directed the completion of improvements at the lake outlet to increase the discharge capacity of the Okanagan River and to minimize flooding. The Board continued to exercise control over the operation of the Zosel Dam at Oroville, Washington.

Kootenay Lake

This Board continued to supervise the storage and flood control requirements attached to the Commission's approval of the operation of Corra Linn Dam. Action was taken in connection with applications for increased storage on the lake and for reclamation on Kootenay Flats. In reference to storage, Bureau officials gave evidence before the Commission at hearing held at Bonners Ferry, Idaho, and at Creston, B.C., in September.

Waterton-Belly Rivers Engineering Board

This Board was appointed by the Commission in April 1948 to advise on the apportionment, between Canada and the United States, of the waters of these rivers and to prepare a comprehensive plan covering the control, conservation, and utilization of the waters to the mutual advantage of both countries. Two members of the Bureau serve on the Board.

St. Mary and Milk Rivers and Sage Creek

Extensive studies concerned with the division for irrigation purposes of the waters of the St. Mary and Milk Rivers were continued. About 40 gauging stations were maintained.

The Sage Creek Engineering Board was appointed by the Commission during the fiscal year and initiated studies on the allocation of the creek waters and on the possibility of creating storage in Canada.

Souris-Red Rivers Engineering Board

As appointed by the Commission in April 1948, two of the three Canadian members of the International Board are from the Bureau. The studies are concerned with the mutual economic utilization of the water resources of the Souris, Red, and Roseau Rivers. Additional hydrometric investigations were conducted by the Bureau.

Niagara River

The Construction Sub-Committee, appointed by the Canadian Temporary Great Lakes-St. Lawrence Basin Committee in 1942, with a Bureau engineer as member, submitted its final report covering the successful construction of a submerged weir in the Niagara River and the accomplishment of the required results. During December, the International Niagara Control Board was concerned with the exchange of notes between the Governments of Canada and the United States in regard to a temporary increase in the diversion from Lake Erie by the Hydro-Electric Power Commission of Ontario.

Water-level and discharge studies of the Niagara River were continued by the Bureau.

Passamaquoddy Tidal Power and Other Boards

An Engineering Board, with the Controller as Canadian chairman, was appointed by the Commission in January to ascertain the costs of the engineering studies necessary to determine the feasibility of the international Passamaquoddy tidal power development.

Other International Boards, on which Bureau officials serve include those relating to Lake of the Woods, Rainy Lake, Prairie Portage, Lake Superior, Massena, Lake Champlain, Lake Memphremagog, and the St. Croix River.

Special Boards and Projects

Snare River Power Project and St. Lawrence Waterway

The construction by the Crown of an 8,350-h.p. hydro-electric development on Snare River, Northwest Territories, was completed and the plant was formally opened October 4. During construction, the Bureau supplied engineering advice and service. Run-off conditions were above normal during the summer, the reservoir was filled to capacity in October, and water was spilled during November.

The 1947 Board of Engineers, Lachine Section, St. Lawrence Waterway, with a Bureau engineer as secretary submitted its final report.

Prairie Provinces Water Board

The Controller of the Bureau acts as one of the two Dominion representatives on this Board which was organized during the year to study the interprovincial waterway problems of the prairie provinces. Meetings were held at Regina in November and February.

Columbia River Surveys

Much of the extensive field investigation in the Columbia River Basin, initiated by the Canadian Section of the International Columbia River Engineering Board, was carried out directly by the Vancouver office of the Bureau. Three field parties made reconnaissance surveys of possible storage reservoirs on the upper tributaries of the Columbia and Kootenay Rivers. Drilling operations in connection with sub-surface investigations of foundation conditions at seven dam-site locations were carried out by the Bureau, in part by contract. Additional stream gauging stations were established, recording gauges were installed, and wells were built for ground-water studies.

Dominion-Provincial Board—Fraser River Basin

Representing parties interested in the development and improvement of the Fraser River and tributaries, this Board was set up in August, the District Chief Engineer at Vancouver being a member. Extensive investigations are planned.

Technical Assistance to Federal Agencies

Indian Affairs Branch

The Vancouver office administered all the water rights on Indian Reserve lands in British Columbia and secured the required licences from the Provincial Government. Much engineering work was done by the western district offices. The Vancouver office did work on 71 projects covering Reserves in British Columbia and Yukon. Thirty of these projects were water-supply problems and 26, irrigation. The Winnipeg office was engaged on seven building repairs and construction projects, and on a flood and erosion survey on Lake Nipigon.

Other Agencies

The Public Works Department was assisted in the major hydraulic problems involved in the development and maintenance of ship channels in the Fraser River. Co-operative programs were continued with the Pacific Biological Station, Fisheries Research Board of Canada; International Pacific Salmon Fisheries Commission; and the Dominion-Provincial Fraser River Basin Board.

Water Power Administration

Power Application in the Yukon

Yukon Electrical Company, which serves Whitehorse and vicinity, made application for the development of a power site on Porter Creek, about seven miles northwest of Whitehorse. The proposed development would have an initial capacity of 400 h.p. and perhaps ultimately 1,600 h.p. It involves diversion of water from Fish Creek and storage on Fish and Louise Lakes which have areas of about 3,600 and 150 acres respectively and are a few miles south and west of Whitehorse. The water available with storage is estimated at 50 c.f.s. and the plant head is about 420 feet. Following an inspection by the Bureau the issuance of an interim licence was recommended.

Lake Minnewanka—Cascade Development

A final licence for this development in Banff National Park by Calgary Power Limited was issued May 14, 1947, but certain phases of operation come under inspection by the Bureau. Final clearing of the flooded areas was completed during the fiscal year. Because of a high rate of discharge by the Bow River during May and June, Lake Minnewanka reached upper regulation level early in August and some water was wasted. The power plant operated close to capacity during autumn and winter months and on March 31, remaining storage was close to normal.

Ghost Development—Bow River and Yellowknife River Plant

Under the terms of the final licence for this development, dated May 14, 1947, one-half the annual rental is paid to the Dominion Government, through the Bureau, for the benefit of the Indians of the Stony Band.

The plant of the Consolidated Mining and Smelting Company of Canada, Limited, on the Yellowknife River, Northwest Territories, operating under Final Licence dated December 24, 1942, had a power output of 23,124,300 kw. hrs. in the calendar year 1948, compared with 24,560,500 kw. hrs. in 1947.

Development by Government Agencies

To establish beyond question the authority of the Minister, with the approval of the Governor General in Council, to develop water powers on lands of the Dominion in the right of the Crown, the Dominion Water Power Act was amended by Chap. 14, 9-10 Geo. VI to empower the Governor General in Council to authorize the construction, maintenance, and operation by the Minister of any undertaking upon lands of the Dominion.

Geographical Bureau

Since its establishment on June 5, 1947, the Bureau has concentrated on compiling data on northern Canada. A great deal of information is required by Dominion Government authorities who administer this large region, look after the health and welfare of its native population, and are charged with undertaking exploration and research and preserving Canada's sovereignty. All those whose work takes them into the far north are approached as sources of geographical material. All data collected are compiled and evaluated by geographers in the Bureau, and a filing system has been organized.

The Bureau has also built up facilities for wide research. It gave considerable attention to the initiation of geographical work on more remote parts of the country and made plans to expand geographical work to foreign areas of importance to Canada. This work will primarily benefit the Departments

of External Affairs, Trade and Commerce, and National Defence and will also aid private, commercial, and mining companies with offices abroad, and transportation companies which have established overseas networks.

Research

Field work was concentrated in northern Canada and largely consisted of exploratory work in virtually unknown parts of the country. Two parties, one operating from the east by ship, the other by aircraft from the west, undertook what is probably the most widely-operating study of the Canadian Arctic Islands since the trips of Stefansson in 1911-17 and of Bernier in 1907-10. The eastern party was on board the United States Navy icebreaker which carried out the United States-Canadian Joint Weather Stations supply mission. The geographical studies supplemented the data collected on this cruise. The party made landings on Baffin, Devon, Ellesmere, and Cornwallis Islands. The western party operated in conjunction with "Operation Magnetic" of the Dominion Observatory. The party made studies where the magnetic party landed on Banks, Melville, Bathurst, and Cornwallis Islands. Moving picture films were taken which will appear in the documentary film Arctic Notebook to be produced by the National Film Board.

Two parties operating out of Port Brabant at the mouth of the Mackenzie River, sailed on the Hudson Bay boat and Royal Canadian Mounted Police boat taking annual supplies to outposts in the western Arctic. They made geographical studies along the routes and at the various ports of call of the boats, and made harbour surveys for the Dominion Hydrographic Service at each locality visited.

One party, operating from Baker Lake, northeast of Churchill, Manitoba, made a detailed traverse and intensive geographical study of both sides of the Thelon River. Its work included survey and mapping of topographical features, water depth soundings, and the investigation of the native population and of their mode of living.

An entirely French-speaking party consisting of a geographer from the Bureau, an anthropologist, a botanist, and a geologist, operated in northernmost Quebec. Its work included geography, geology, anthropology, botany, and wildlife studies along the overland route from Ungava Bay to Hudson Bay.

In February and March, one geographer accompanied a United States naval expedition to Greenland and Iceland.

A booklet, "An Introduction to the Geography of Newfoundland" was issued at the time of Newfoundland's entry into Canada.

The text, photographs, and maps were assembled for a National Film Board filmstrip on the Geographical Regions of Canada intended for use in Canadian schools.

Information was assembled for preliminary planning of an Atlas of Canada. Cabinet approval was given for this interdepartmental long term project. The Geographical Bureau will carry out the details of plans formulated by an interdepartmental committee.

Map and Photograph Library

The Bureau is building up a well-catalogued series of maps of Canada and foreign countries adequate for the needs of all Government departments. A complete set of all Canadian map sheets from federal and provincial sources is being collected and foreign maps are being obtained by exchange and purchase. Most of the Canadian maps have been acquired and catalogued.

A photograph library is being established.

Library

Organization and expansion of the library was continued. All books, pamphlets, and reports are classified under a specially designed geographical system adapted from the Boggs and Lewis system in the United States.

The gift of a large number of atlases on the history of Canada is of special interest.

Microfilm rolls of the Research Catalogue of the American Geographical Society are a guide to current and earlier geographical literature and may be read in the library's microfilm projector.

Scientific and other Meetings

The Bureau was represented at the annual meeting of the American Geological Society in October, and at Wisconsin in December, for the annual meeting of the Association of American Geographers.

The Lisbon, Portugal, meeting of the International Geographical Union Congress, originally planned for 1948 was postponed until April 1949. An exhibit of Canadian maps and a map, photograph, and textual exhibit showing the Geographical Regions of Canada was prepared and sent to Lisbon for the Conference.

National Museum of Canada

Considerable progress was made towards enhancement of the Museum's activities and services, especially in relation to field work, publications, exhibits, educational work and general renovation. Studies of birds and mammals in southwestern and central western Saskatchewan, botanical work in Manitoba and Yukon, archaeological research in the prairie provinces, Yukon, and northern Quebec, and on Baffin Island, and ethnological investigation in British Columbia, Quebec, and Nova Scotia provided a wealth of new information essential to the furtherance of the program of the Museum.

An Annual Report of the National Museum for the Fiscal Year 1947-48 was issued, the first since 1939, and a bridging volume of Annual Reports 1939-47 was in press. Six museum bulletins were published.

The beaver habitat group, work on which had been in progress for several years was completed, and a red fox group was begun. Two large paintings showing officers of the Geological Survey at work in the field were completed and hung in the mineral hall. One is of Sir William Logan, the first Director of the Survey, at Percé in Gaspé; the other is of a recent field party in British Columbia. An Eskimo picture and an Indian picture were also completed and hung in the west anthropological hall. Work has begun on a large painting to illustrate what the three Triceratops dinosaurs, whose skeletons stand in the Hall of Vertebrate Palaeontology, were actually like in life.

In July and August a film program, "Canada in Colour", was put on every afternoon, Monday through Friday, to give visitors to Ottawa an opportunity of seeing various interesting parts of Canada. For part of July and August the celebrated Marsh collection of water colours showing Eskimo subjects was on exhibit in the rotunda. Autumn and winter lecture series were again held on Wednesday evenings for adults and on Saturday mornings for children. In October, the May Court Club of London, Ontario, put on two evening marionnette performances for adults and two on Saturday morning for children. An Indian legend was dramatized, and its enthusiastic reception showed that dramatization is an effective method of arousing interest in Canada's folk-lore.

A group of children interested in natural history was organized into the Macoun Field Club to take summer field excursions around Ottawa on Saturdays, and in the winter, to study natural history at the Museum. A Dominion-

wide broadcast over the C.B.C., with two members of the Museum staff answering questions about dinosaurs, brought in hundreds of requests for additional information on the subject and appreciative letters from all parts of Canada.

The lecture room was improved by enlarging the projection booth and laying a new hardwood floor on the stage. A much-needed 35 millimetre projector was installed.

The first annual meeting of the Canadian Museums Association was held in the National Museum in September, the principal speaker being Sir Eric Maclagan, former Director of the Victoria and Albert Museum, London, England. The Curator of the National Museum spoke on the functions of a scientific museum. The National Museum was represented at the meeting of the American Association of Museums at Boston in May and at the Northeastern Conference of that Association at Rochester on October 15 and 16.

Dr. C. E. Cairnes was named Curator of Geology, Dr. E. Poitvin, Curator of Mineralogy, and Dr. W. A. Bell, Curator of Invertebrate Palæontology. These officers of the Geological Survey will maintain co-operation between the Survey and the National Museum.

Through his retirement on superannuation on September 5, 1948, the Museum lost the services of Dr. C. Marius Barbeau, distinguished member of its staff and noted authority on native culture, tradition and folk-lore. Dr. Barbeau is perhaps best known in Canada and abroad for his many writings and lectures on the arts, crafts, and folk songs of Quebec, and on the culture and folk-lore of the early Indians of the northwest coastal areas.

Dr. Diamond Jenness, recognized world authority on the Indian tribes of Canada and on the Eskimos of the Canadian Arctic, also retired on superannuation.

For work done for the Intelligence Services during the war, A. E. Porsild was awarded on July 1, 1946 the insignia of the Most Excellent Order of the British Empire.

Archaeology

Douglas Leechman visited a number of amateur collectors in the Prairie Provinces and examined the sites on which they had been working. He then visited a number of Indian villages near Hazelton, British Columbia. Later he worked in southern Yukon and neighbouring sections of British Columbia and Alaska, mainly to elucidate the old migration routes from Asia into America and to search for archaeological sites in which cultural material is sufficiently concentrated to make excavation worth while.

In April, he lectured to the Rochester Museum and to the New York State Archaeological Society; in May he attended the annual meeting of the Society for American Archaeology in Milwaukee and examined collections in the museum there and at nearby archaeological sites; in October, he attended the Fourth Iroquois Conference at Salamanca, N.Y., and in December, the annual meeting of the American Anthropological Association in Toronto. In March, 1949, he addressed a seminar of the Arctic Institute of North America at McGill University on the subject, "The Native Peoples of the Arctic and Sub-Arctic."

In the office, he prepared reports on material collected in 1947 and continued his work on the study of migration routes.

Catharine McClellan and Dorothy Rainer made an intensive study of the Interior Tlingit and of their neighbours of Kutchin origin. They worked with native informants at Carcross, Klukshu, Burwash Landing, and Teslin, and collected much important information on the inter-relation of these two native groups.

Jean P. Michea discovered a number of interesting Eskimo store ruins on the coast of Ungava and inland, and obtained many anthropological specimens and photographs. This work was done for the National Museum in collaboration with members of an expedition in charge of Dr. Jacques Rousseau, Director of the Montreal Botanical Garden.

Anthropological investigations at Frobisher Bay on Baffin Island by Dr. Henry B. Collins of the Bureau of Ethnology, Smithsonian Institution of Washington, assisted by Colin Thacker of the National Museum staff, led to the discovery of semi-subterranean houses built of stones, whale bones, and turf. The excavations revealed evidence of Dorret-Thule relationships in a region not previously studied. Measurements and physiological observations were also made of some eighty living adult Eskimos. Through the courtesy of the Chief of the United States Meteorological Service, the party was flown to and from the field by United States Air Force planes. A preliminary report on this work will appear in the forthcoming Annual Report of the National Museum.

Ethnology

Seven parties were sent to the field in 1948, one to Nova Scotia and six to Quebec and Ontario. Details of some of the work accomplished will appear in bulletins to be published by the National Museum. More extended accounts for four parties than are given below will appear in the Annual Report of the National Museum.

Marcel Rioux, assisted by Maurice Tremblay, Professor of Sociology at Laval University, and by Claire Mathieu, of St. Anne's Military Hospital, investigated the small peasant community of Isle-Verte in the St. Lawrence River near Riviere-du-Loup, Quebec. They gathered data on religion, social organization, economics, lore and learning, ethics, family, kinship, culture change, social control, and other topics.

Miss Creighton continued to collect folk-lore materials in Nova Scotia. She was engaged mainly in making phonograph records of folk songs and folk tales.

Miss Roy collected folk tales and folk songs, and data on folk beliefs, medicine, domestic arts, and other topics in the Gaspe region.

Messrs. Lacourciere and Savard continued their research on the folk-lore of Charlevoix County.

Miss Doyon collected folk-lore materials in Beauce County, Quebec, especially on popular dances of the region.

Francois Brassard collected folk songs and folk-lore material in a few localities in Chicoutimi, Quebec County and in Ontario.

Mrs. Juliette Caron Dupont obtained valuable folk-lore materials from the Magdalen Islands.

Marius Barbeau completed the manuscript of a large monograph on totem poles, based on his many years of field investigations along the north Pacific Coast. In it he describes more than 400 poles and house posts, nearly all of which are illustrated. He lectured on Canadian folk songs in various centres in New York State and in the New England States and made a check on important materials on totem poles in the museums. His last lecture in this series was given at the Library of Congress in Washington.

A. Pouinard, a French musicologist, transcribed and analyzed many folk songs taken from the Museum collections. His research was made possible through a grant from the Rockefeller Foundation, and through the assistance of the National Museum.

The folk-lore collections were greatly increased by documents obtained in local or parish archives in the study of folk-lore and mythological themes.

Zoology

Research was continued on the taxonomy and distribution of the birds of Canada, with particular attention to such species as the savannah sparrows, olive-backed thrushes, brown creepers, and brown-headed chickadees. A revision of the races of the brown-headed chickadees was nearing completion, but material from certain strategic localities is still needed.

A report on the birds of Lake Mistassini and Lake Albanel, Quebec, was submitted for publication and a report was being prepared on the birds of southwestern and central western Saskatchewan. Work was begun on a popular Museum bulletin which will deal with some of the common birds of Canada.

A method by which the native caribou can be distinguished by skull characters from the closely-related introduced reindeer was worked out for use by the Dominion Wildlife Service. A comprehensive taxonomic study of the mammals of Lake St. John region, Quebec, was completed, and a manuscript was prepared for publication. A similar study of the mammals of Lake Mistassini, Quebec, was in progress.

The Division benefited by the addition of 57 plant specimens collected by Dr. Collins' expedition to southern Baffin Land.

W. E. Godfrey conducted field work on the birds and mammals of western Saskatchewan. The broad purpose of this work is to acquire a knowledge of the distribution, classification, and economic status (beneficial or harmful to man's interest) of the birds and mammals. The first stage of his work was centered in the ecologically varied Cypress Hills region. In this, emphasis was placed on the higher parts of the Cypress Hills, although his party also did work in the surrounding plains, south to the Montana border, and north to Crane and Big Stick Lakes. During the remainder of the field season he studied the area between Flotten and Meadow Lakes. His party collected 946 birds, 123 mammals, and 9 amphibians, and took coloured motion pictures. A report will be prepared on the birds and mammals of the regions investigated.

The exhibition case for a red fox group was completed, and the background painting and fabrication of plant accessories were well underway. A map of Canada on a six- by eight-foot panel, to indicate the geographic localities portrayed in the mammal groups, was completed and placed on the wall of the exhibition hall. Eight exhibits from the Division of Entomology, Department of Agriculture, were added to the entomology display. Birds, mammals, and osteological material were prepared for the study collections, and birds for exhibition and for the School Loan Collection. A natural history display was installed at the Sportsmen's Show, held in Ottawa April 5 to 10, 1948.

Two hundred and fifty-two mammals and birds were supplied from the School Loan Collection for use in nature study classes.

Some manuscript was prepared for a proposed publication on the herpetology of Canada. A miniature grizzly bear was modelled, cast, and coloured for display.

The Museum loaned a considerable number of birds and mammals from its study collections, for examination and comparison, to the United States Fish and Wildlife Service, Washington, D.C.; University of Michigan, Ann Arbor, Michigan; Cornell University, Ithaca, New York; Doane College, Crete, Nebraska; Royal Ontario Museum of Zoology, Toronto, Ontario; Museum of Comparative Zoology, Cambridge, Massachusetts; National Research Laboratory, Ottawa, and to various individuals. Material for taxonomic study was borrowed from the British Columbia Provincial Museum; United States National Museum; Cleveland Museum of Natural History; and from Hoyes Lloyd, Ottawa.

The following donations warrant special mention: Caribou material from northern Quebec, donated by Duncan A. Hodgson; 145 birds and mammals, Ungava Bay, donated by John P. Hildebrand; 36 birds and mammals, Eastern Arctic, donated by John P. Kelsall, Dominion Wildlife Service; 11 birds Baghead, N.S., donated by Stuart D. MacDonald; and Alberta and Saskatchewan mammals, donated by National Parks Service staff.

National Herbarium

A. E. Porsild, Chief Botanist, made an extended tour of the southwestern United States on special leave during May and June, visiting the principal United States National Parks, and botanical collections. Before his return to Ottawa he spent two weeks in British Columbia and Alberta studying the alpine flora and collecting several hundred sheets of plants for the Herbarium.

He prepared a 23-page report for publication on a collection of plants from Nuelten Lake, Northwest Territories, made in 1948 by Francis Harper who was aided by a grant from the Arctic Institute of North America. He also prepared a report on the collection of *Antennaria* made in Ungava by Dr. Jacques Rousseau in 1947 and 1948 under a similar grant.

H. J. Scoggan led a field party in a survey of the Norway House-Cross Lake and northern Lake Winnipegosis areas of northern Manitoba. About 2,650 numbers of plant specimens resulted from this survey, each representing a collection of six sheets of material. The collections were made to illustrate the various ecological habitats encountered, and photographs were taken to show the general topography and vegetation types. His "Flora of the Gaspé Peninsula, Quebec" was nearing completion.

W. K. W. Baldwin collected seeds of various tree species at Goose Bay, Labrador, following a request from the Danish Forest Service. He prepared a summary report of the 1947 James Bay-Hudson Bay expedition for publication in the National Museum Annual Report.

J. D. Campbell accompanied a Geological Survey field party to the McQuesten district, Yukon, where he collected approximately 900 numbers of plants, each represented by two sheets of specimens.

I. Hustich, of Helsingfors, Finland, carried out forest botanical studies in central Ungava under the sponsorship of the Arctic Institute of North America and the National Museum of Canada. He collected approximately 3,000 plant specimens, including duplicates, and submitted a preliminary report entitled "Forest Botanical Field Work in Ungava, 1948".

Accessions, Loans and Exchanges

During the year, 5,511 herbarium specimens were received by exchange and 2,065 by donation, and approximately 11,400 specimens were collected in field work. Five hundred and twenty-four specimens were loaned to and 16 specimens were borrowed from other botanical institutions. Duplicate specimens distributed to other herbaria in Canada and abroad in continuation of exchanges numbered 5,840. Fifty one packets of seeds from Goose Bay were sent, as a gift, to the Forest Genetic Laboratory, Copenhagen, Denmark, for use in afforestation work in South Greenland, and five packets were sent to Dr. C. Heimburger for experimental work at the Southern Experiment Station, Maple, Ont. Nine thousand, two hundred and twenty-five specimens were mounted and inserted in the herbarium, bringing the total of numbered specimens in the National collection to 198,345.

Vertebrate Palæontology

The Vertebrate Palæontology staff was transferred from the Geological Survey to the National Museum.

C. M. Sternberg continued his studies of the dinosaur collection. He made a scale model to illustrate the type skull of the thick-nosed dinosaur and completed the description of this new family. He headed a party collecting Triassic fish fossils in the Wapiti Lake district of British Columbia.

Educational Work

The Education Section continued its varied services to the general public, school classes from Ottawa and outside localities, and to special groups. By this channel the results of conservation and research are interpreted through the medium of correspondence, publications, and loans of visual aids, as well as through participation in the activities of the Museum at Ottawa. The increase in attendance, especially by school groups, and the increasing demand for the services mentioned, demonstrate the interest of educators and others in co-operating with the Museum. Normal school students paid their annual visit to the Museum as an aid to their studies.

Visitors to the exhibition halls numbered 150,000 and included scientists, teachers, students, and the general public. Special museum educational activities were attended by 68,648. The scientific staff arranged educational exhibits for organized study groups, the largest of which had an attendance of 6,400. The total attendance was 225,048.

At the request of the Children's Museum Committee of the International Council of Museums, an exhibit was prepared to illustrate the National Museum's educational work for children, and was sent to Paris for display at the First Biennial Conference of the International Council of Museums at Unesco House, June 28-July 3. Subsequently, it was circulated among French schools and colleges for demonstration purposes.

The National Museum and the National Film Board collaborated in the preparation and showing of a film program, "Canada in Colour" in the Lecture Hall during the afternoons of July and August. These programs were arranged chiefly for tourists visiting the Museum.

National Museum Lectures

The Museum lectures had a total attendance of 21,475; of these 7,975 were adults and 13,500 were children. The lectures are arranged by a committee of which Dr. F. J. Alcock, Chief Curator of the National Museum, is chairman, and Miss Mabel Godwin is secretary. Lectures for adults are given on Wednesday evenings, and those for children on Saturday mornings.

Adult Lectures

The New India, by the Honourable Hardit Singh Malik, C.I.E., O.B.E., I.C.S., High Commissioner for India, Ottawa.

Problems of the Snows, by Robert F. Legget, M. Eng., M.E.I.C., Director, Division of Building Research, and Chairman, Associate Committee on Soil and Snow Mechanics, National Research Council, Ottawa.

Motion Picture Program, Down to the Sea and The Raider.

Canada's Pioneer Chatelaines, by Sophy L. Elliott, Westmount, Que.

Wanderings in Scandinavia and the British Isles, by M. G. Davis, B.Sc., M.Sc., Dominion Horticulturist, Central Experimental Farm, Ottawa.

The Iron Empire of Ungava and Labrador, by J. A. Retty, Ph.D., Montreal, Que.

A Motion Picture Program, Bush Christmas, shown through the courtesy of the Australian High Commissioner and J. Arthur Rank Films, Limited.

The Impossible Takes a Little Longer, by R. H. Hall, Bell Telephone Company of Canada, Montreal, Que.

Traditional Architecture of Quebec, by E. R. Adair, B.A. (London), M.A. (Cantab), F.R.H.S., Professor of History, McGill University, Montreal, Que.

Science and the Angler, by V. E. F. Solman, M.A., Ph.D., Limnologist, Dominion Wildlife Service, Department of Mines and Resources, Ottawa.

In addition to the regular Wednesday evening series, two special programs were given. A marionette presentation by the London (Ontario) May Court Club on October 29 and 30 attracted wide attention. Its feature was a play adapted from a Huron legend in the National Museum collection. The program was presented also to the children's audiences on the morning of October 30. On February 18, Professor William H. Hobbs, of Ann Arbor, Michigan, gave two excellent lectures, "Polar Mirage and the History of Exploration" to an afternoon audience, and "The Earlier Glaciers of North America" in the evening.

Children's Lectures

Holidaying in Canada's National Parks, by Dr. V. E. F. Solman, Department of Mines and Resources.

Junior Field Naturalists Take Over, by members of the Macoun Field Club, Ottawa.

Motion Picture Program, The Raider.

Children's Australia Day—a presentation of the film, Bush Christmas, shown through the courtesy of the Australian High Commissioner, and J. Arthur Rank Films, Ltd.

Children of Other Lands—France, a pantomime by children of the French Embassy (in collaboration with the Citizen's Committee on Children).

Motion Picture Program, The Enchanted Forest.

Mother Earth Blows Her Top, by Dr. F. J. Alcock, National Museum of Canada, Ottawa.

Let's Go Fishing, by Dr. A. L. Pritchard, Department of Fisheries, Ottawa.

Animals and Birds of the Canadian West, by W. E. Godfrey, National Museum of Canada, Ottawa.

The Loon's Necklace, by Dr. Douglas Leechman, National Museum of Canada, Ottawa.

Children of Other Lands—India, a pantomime by children from India; through the courtesy of the High Commissioner for India (in collaboration with the Citizen's Committee on Children).

A special program introducing "Be Kind to Animals Week" was given on May 1 to senior pupils of the public schools.

The assistance of the Boy Scouts and of the Commissionaires on Saturday morning in looking after the large number of children who come to the Museum is greatly appreciated by the Lecture Committee.

Group Visits and Lecture Hall

Visits were made to the Museum by groups from local and outside schools, who were conducted through the various exhibition halls. Special tours for junior grades were also arranged. Groups came from London, Belleville, North Bay, Perth, and Eganville, Ontario; Bristol and Poltimore, Quebec, and other centres.

The Lecture Hall was made available to scientific and related organizations for meetings and 142 reservations were made during the year. There was a total attendance of 44,075, and approximately 387,950 feet of film were shown.

Visual Aids and Publications

A large amount of Museum material on anthropology, biology, and other phases of natural history in Canada went to teachers, students, and others in all parts of Canada. This material is lent free of charge to educational institutions in Canada except for cost of transportation one way.

More than 40,000 copies of Museum publications were distributed. An increasing number of educational institutions have found Museum publications of value, and have encouraged students and others to make full use of a wide selection of this material.

Dominion Observatories

The Dominion Observatory at Ottawa and the Dominion Astrophysical Observatory at Victoria, B.C., are responsible for all research in astronomy carried out by the Federal Government. In addition to studies of purely scientific interest, data and services of practical application are regularly maintained, notably in the Time Service of Canada, which is an activity of the Ottawa Observatory.

The Dominion Observatory is also charged with geophysical research in seismology, terrestrial magnetism, and gravity. The Seismological Service of Canada, centered at Ottawa, undertakes field studies of all earthquakes occurring in Canada and seismic studies of the earth's crust. The magnetic map of Canada, extending from the United States border to the North Pole and definitely locating the north magnetic pole, is under continuous construction and modification, with the co-operation of other Government services. A gravity survey of Canada has been under way for many years to provide a gravity map of Canada, thus contributing largely to the research on crustal structure in this part of North America. These research programs are planned in collaboration with Canadian geological and mining organizations.

Dominion Observatory

Positional Astronomy and Time Service

Astronomical observations with a broken-type transit for the determination of clock corrections were made on 184 nights, and 2,374 star transits were taken. Chief reliance is still placed on the Shortt pendulum clock and a crystal clock. Seconds beats from two other crystal clocks, one at the National Research Laboratories, and the other at the Monitoring Station of the Department of Transport, are monitored each day.

Time signals were sent continuously by wire to the Canadian Broadcasting Corporation, National Research Council Laboratories, the Monitoring Station of the Department of Transport, and Naval Headquarters, Ottawa, for relay to Halifax twice daily and for broadcast over CFH to ships in the Atlantic. The Canadian National Railways and the Canadian Pacific Railway received time signals by wire for a period of two minutes daily direct from the Observatory. These were sent by them across their systems from coast to coast. Wireless time signals were broadcast through the Canadian Broadcasting Corporation chain of stations daily, at 1 p.m. E.S.T. Time signals were broadcast continuously from station CHU, serviced by the Department of Transport, on 3330 kc., 7335 kc., and 14670 kc.

Foreign time signals were received daily from WWV and NSS on receivers located at 50 Perth Street, Ottawa, connected to the Observatory by telephone line, and operated by a selector switch. Times of reception of these signals and the corrections to the primary clock were published every two months.

The 750 electrically operated clocks in Government buildings in Ottawa, synchronized from the Observatory, were maintained. Observatory clocks, watches, and other timing mechanism, were kept in repair and overhauled for other Government offices.

Meridian circle observations were made on 67 nights, and 1,432 observations were obtained, along with 182 nadir readings and 128 sets of instrumental constants. Data were collected towards a new list of stars for observing.

The computations of the observations taken from 1923 to 1935 were continued. The catalogue of stars, observed from 1911 to 1923, was in press. Tables of sunrise, sunset, moonrise, moonset, phases of the moon, and eclipses, were supplied. Computations for the Chichester sun compass were made at the request of the Department of National Defence.

Stellar Physics Division

The Division continued the study of meteor paths undertaken in the summer of 1947 in co-operation with the National Research Council. Observations were made on 33 nights during which six annual meteor showers were observed, namely the Lyrids, Eta Aquarids, Delta Aquarids, Perseids, Orionids, and Geminids. Twenty-five meteor photographs were obtained, 3,508 visual records were made, and 1,500,000 meteors were recorded by radar methods. It was found possible to make accurate measures of meteor heights by the method of three-station triangulation and the results, combined with visual methods, led to a very accurate determination of the part of the earth's atmosphere in which meteor phenomena take place. Similar methods applied to the actual motions of meteors in space have made it possible to determine accurate orbits for these mysterious visitors from outside space and to ascertain the part of the solar system from which they come.

Work on the International Program of Meteor Photography in co-operation with the R.C.A.F. and Harvard University was mainly confined to the preparation of equipment. Construction of the two 20-inch meteor cameras to be used in this program was well under way, and work was proceeding on the two meteor observatories at Meanook and Newbrook in Alberta, 25 miles apart. It is proposed to use the two cameras in a program of photographic triangulation to determine the heights and space motions of faint meteors. This work was undertaken mainly to solve certain problems of importance to National Defence in connection with flight of long-range projectiles, but it will also make possible valuable advances in the field of fundamental science.

Use of the photographic telescope was devoted to a study of the distribution of energy in the continuous spectra of stars. These observations are used in determining the temperature of stars and in studies of the absorbing qualities of the earth's atmosphere and of interstellar space. For this program a new calibrating spectrograph was constructed to impress exposures of known light intensity on the photographic plates, the Observatory's Moll microphotometer was altered to make possible direct measures of photographic blackening, and a new darkroom with necessary water supply was installed in the small observatory housing the photographic telescope.

Much effort was devoted to interpreting the spectra of the P Cygni stars formerly obtained by the Dominion Astronomer at the Dominion Astrophysical Observatory in Victoria. These objects continually eject huge amounts of material into space with velocities of several hundred miles per second. Some of them are very luminous, one in particular being 250,000 times as bright as the sun. Special attention was given to theories explaining the forms of the spectral lines of these stars and progress was made in interpreting the complex lines in terms of the velocity distribution of atoms ejected from the surfaces of the stars. In collaboration with scientists at the Yerkes Observatory of the

University of Chicago, attempts were made to determine the nature of the forces responsible for the ejection of atoms. It will probably be some years before a complete solution to this outstanding astrophysical problem is found.

The study of variations in the sun's radiation and their correlation with conditions on the earth was continued and special attention was paid to the improvement and modernization of equipment. A Brown electronic recorder and photo-cells were purchased to record the intensity of light in the infra-red region of the solar spectrum. Plans were drawn up for a new spectrographic arrangement to make use of a diffraction grating of unusual light-concentrating power on loan from the Mount Wilson Observatory.

Various scientific papers describing the work of the Division were prepared for publication, and reports on these papers were presented to a number of scientific associations, including the International Union of Geodesy and Geophysics in Norway and the Pacific Science Congress in New Zealand.

Division of Seismology

Eight hundred and seventy-six earthquakes were recorded. The largest of these were reported by telegram to Science Service in Washington for a rapid determination of their epicentres. The readings of the earthquakes recorded were reported in monthly bulletins and distributed to all seismological stations of the world. In co-operation with the Quebec seismograph stations, monthly reports were issued dealing with the recording of local earthquakes in the area. A co-operative program with all stations in the northeastern section of America was continued.

A report on seismology in Canada from 1939 to 1948 was given at the meeting in Oslo of the International Union of Geodesy and Geophysics. The status of the seismic survey project was reported to the American Geophysical Union in Washington and to the I.U.G.G.

A type of earthquake, originating from 125 to 200 kilometers from Ottawa and having a distinct, but as yet unidentified, phase in addition to recognized arrivals, was being studied. The analysis of the world records of the British Columbia earthquake of 1946 progressed to the point where a definite location of its origin can be made. The azimuth and dip of the fault along which the movement took place were determined and the velocity of the P-phase of this earthquake, in the layer of the earth immediately below the crust, was computed. An endeavour was being made to correlate the data on the earthquake with what is known of the geologic conditions of the Canadian west coast.

The seismic survey of Canadian Shield areas in northern Ontario and Quebec was continued, using the energy from rockbursts in the Kirkland Lake region as the source. In the summer, field stations were occupied at distances within 25 miles of the source of energy. During the winter, more permanent stations were set up at Ville Marie, Timiskaming, and Rolphton. Considerable success was obtained from both the summer and winter installations. The stations of this survey contribute also to the regular earthquake registration work of the Canadian service.

A complete report was being prepared on a small local earthquake that occurred May 9 some distance north of Montreal. There were other small earthquakes in the same area in June and July. On February 2, 1949, Ottawa was disturbed by a very slight tremor.

A short-period Benioff seismograph was added to the equipment at the Victoria station.

Division of Terrestrial Magnetism

Magnetic observations were made at 36 field stations. Thirteen of these stations were in Ontario, five in the Eastern Arctic, five in the Hudson Strait and Hudson Bay area, and thirteen in the central and western Arctic area.

An analysis of the Arctic data, including those of 1946 and 1947, indicates the north magnetic pole to be in northern Prince of Wales Island at approximately 73° north latitude and 100° west longitude. Declination observations were made for the Dominion Observatory by the Geodetic Survey at 18 astronomical control points in Melville Peninsula and Baffin Island and by the Topographical Survey at 17 survey points in northern Canada.

The permanent magnetic observatories at Agincourt, Ontario, and Meanook, Alberta, operated continuously. The temporary observatory at Baker Lake, N.W.T., operated on a restricted basis pending erection of a new non-magnetic building. A temporary magnetic observatory was established at Resolute Bay, N.W.T., where a non-magnetic building of prefabricated construction was erected.

Development and construction of absolute and recording instruments were continued. The second electrical-induction type of universal magnetometer was constructed and used for work in the environs of the north magnetic pole. Six sets of electrical, visual-recording variometers were constructed, two of which were installed at Baker Lake and two at Resolute Bay. The adaptation of the electrical-type, universal magnetometer for airborne surveys was undertaken at the Department of Physics, University of Toronto.

Compilation and construction of magnetic maps and charts, formerly done by the Surveys and Mapping Bureau, was transferred to the Dominion Observatory in November.

Photostats of all Agincourt magnetograms were made available to the National Research Council, the Department of Mines and Resources, and six geophysical prospecting companies. Tabulations of K-indices for each month for Agincourt and Meanook were sent to the Carnegie Institution and United States Bureau of Standards, Washington, and to one aerial prospecting company in Canada.

Division of Gravity

One hundred and thirty stations were established with the gravimeter and a vertical magnetometer in an area extending 120 miles eastward from Ottawa to Berthierville and averaging about 50 miles north of the St. Lawrence River.

One hundred and thirty-five magnetometer and 325 gravimeter observations were made with Observatory instruments over the Sudbury Basin and in the immediate vicinity.

Two hundred gravimeter and magnetometer observations were placed within an area of 150,000 square miles north of latitude 60°, north and south of Great Slave Lake. Three hundred observations were completed with a gravimeter on the surface and underground at Noranda and Lake Shore mines, and 70 stations were established along the railway between Quebec and Cochrane.

General

Dominion Observatory representatives presented papers at meetings of the Royal Society of Canada, Vancouver; the Canadian Institute of Mining and Metallurgy, Winnipeg; the Eastern Section of the Seismological Society of America, Cleveland; the American Geophysical Union, Washington; the International Astronomical Union, Zurick; the International Union of Geodesy and Geophysics, Oslo; and the Seventh Pacific Science Congress, New Zealand. Lectures on scientific subjects were presented to groups in Canada and the United States.

Alterations to the machine shop were completed and an auxiliary generating plant was established there to permit continuous operation of the Observatory services during power shortages.

Electrical wiring of the Observatory was undertaken. When the wiring is in place, the redecorating of the offices will have been completed.

Dominion Astrophysical Observatory, Victoria, B.C.

Substantial progress was made in all phases of the Observatory's activities. Fundamental astrophysical research programs were actively advanced. Telescopic photographs were measured and reduced and several completed researches were published. The Observatory was represented at three important scientific congresses where reports were given and papers presented. Extensive improvements were made in the Observatory grounds and buildings and new instruments were acquired.

Cordial relations and interchange of ideas with other observatories and astronomers were maintained. Four astronomers attended the meetings of the Royal Society of Canada at the University of British Columbia, Vancouver, B.C., June 14 to 17, and six research papers were presented. On the concluding day of the meeting about 250 Fellows and delegates visited the Observatory.

The Observatory was represented at the dedication of the 200-inch Hale Telescope of the California Institute of Technology.

The first meeting of the International Astronomical Union since 1938 was held at Zurick, Switzerland August 11 to 18 and was attended by 250 astronomers from thirty-one countries. Dr. J. A. Pearce represented the Observatory, and presided over the meetings of Commission number 30, Stellar Radial Velocities, of which Commission he was reappointed president. His report of the work of the Commission and Dr. R. M. Petrie's report as chairman of the subcommittee dealing with wave-length standards were adopted. Dr. A. McKellar, Chairman of a subcommittee of Commission number 29, communicated the report on Molecular Bands in Stellar Spectra, which was adopted. The fundamental character of the research being accomplished at the Observatory and its importance were recognized by the I.A.U.; Dr. K. O. Wright was appointed chairman of a subcommittee on Spectrophotometry; and Dr. A. McKellar was named president of Commission number 15 on the Physical Study of Comets. The Observatory is represented by the above astronomers on eight different commissions of the Union.

Observing Statistics and Programs

The telescope was used on 181 nights, wholly or partly clear, for a total observing time of 1,012 hours. Owing to unusually cloudy summer and autumn seasons the number of observing hours was 15 per cent below the 30-year average.

The telescope was devoted exclusively to stellar spectroscopy and 1,263 spectrograms were obtained. Progress was made in the four faint star programs, namely, the B-type stars north of declination $+20°$, and between magnitudes 7·5 and 9·0; the R- and N-type stars north of the equator; stars in the North Galactic Polar Cap; and a limited program of interesting binary stars.

Stellar Motion Studies

Radial Velocities

A total of 1,298 spectra, principally of faint B-type stars, was measured for radial velocity.

Stellar Wave Lengths

The fundamental work of revising the wave-length standards for radial velocities was continued. This investigation will place all radial velocities upon a common dynamical basis so that systematic differences between different dispersions and over various spectral types will be eliminated. The wave-length standards for single-prism and two-prism spectra of classes A-K were completed and the revision was being extended into helium or class B stars. The report on wave-length standards was adopted by Commission number 30 of the International Astronomical Union.

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Spectrographic Binaries

The orbital elements of a number of spectrographic binary stars were determined. The masses and dimensions of the 9th magnitude BO-star H.D. 193611 were determined from the measures of 31 spectra. The difference in magnitude between the components was spectrophotometrically determined, and the distance of the system, 1,500 parsecs or 4,900 light years, was deduced from the measured intensities of the K-line. The components are massive stars, each being more than 14 times the mass of the Sun. From considerations of their absolute magnitudes and masses, an orbital inclination of 77° was deduced and a small partial eclipse was predicted. This eclipse was subsequently verified by Dr. S. Gaposchkin, of Harvard College Observatory.

The orbital elements of the B-type star H.D. 198784 were deduced.

A very interesting and important eclipsing system in the star H.D. 215835 was discovered and investigated. This 9th magnitude star is in the galactic star cluster N.G.C. 7380 in the Constellation of Cepheus. The analysis of the 36 observations showed that the system is composed of two giant, high temperature stars revolving with linear speeds of 260 and 320 km/sec. in circular orbits every 2 days, 2 hours, and 40 minutes. Extremely hot, with surface temperatures of 36,000° absolute, the stars are of spectral type 05, the earliest of all eclipsing system. Their linear diameters are 8,380,000 and 7,350,000 miles and their intrinsic luminosities are 91,000 and 69,000 times that of the sun. With a combined mass of 62 times that of the sun, the system is one of the most massive known. The distance deduced from the measured intensity of the interstellar K-line is 6,800 light years. Thus the light from the system started on its journey to the earth 200 years before the construction of the Great Pyramid by Khufu.

The orbits of the fifth magnitude A-type system H.D. 171978 were deduced. The separation of the double-lines is always small and detectable only with II L dispersion, which explains how such a bright object had escaped discovery until now.

The Ursa Major Cluster

A detailed analysis was made of this well-known moving cluster, using Victoria II L and Lick III Prism radial velocities. It was clearly shown that the radial velocities of the nucleus stars deviate from the cluster motion and convergent, as found from the extended group. This important result indicates that the outlying stars formerly considered as members are not real members of the moving cluster. The methods of Charlier and Bohlin for finding the convergent from proper motions was found to be unsatisfactory for this cluster. A new method for determining the convergent was devised, employing differential corrections. This study combines proper motion and parallax data with radial velocities and demonstrates for the first time, it is believed, that all aspects of the motion satisfy the requirements of a true moving cluster for these stars.

Astrophysical Researches

Giant Red Stars

Several important advances were made in studies of the spectra of the cool red giant stars. Because of the extreme redness of these objects, low-dispersion must be employed and long exposures are required. The first direct observational evidence of the existence of polyatomic molecules in stellar atmospheres was found by the discovery of a group of very intense absorption bands in the far-violet region of the spectrum of the N-type star Y Canum Venaticorum. These bands, between wave lengths 4100-3940 Angstrom units, were tentatively identified as being caused by the CH_2 molecule. A general discussion of polyatomic molecules in stellar atmospheres was published in collaboration with Professor P. Swings, of the University of Liège.

The unidentified absorption band found in 1941 by R. F. Sanford, of the Mount Wilson Observatory, in the red region, λ6260, of the spectra of the carbon stars was shown to be due to the 4·0 $C^{13}N$ band of the red CN system. The laboratory work of Herzberg and Phillips gave a basis for this identification and indicated that the previous work on the isotopic effect in this system by Fehrenbach and Daudin was in error.

The extended investigation of the intensities of the main ($C^{12}C^{12}$) and isotopic ($C^{12}C^{13}$ and $C^{13}C^{13}$) bands of the Swan system of C_2 near λ4740 for 21 stellar spectra of type R was completed and prepared for publication. By making various assumptions, it was possible to arrive at values of the abundance ratio of C^{12} to C^{13} for the stellar atmospheres. For six of the stars, the bands were too strong to give reliable results. For three of the stars, little evidence for the presence of C^{13} was present, and the C^{12}/C^{13} abundance ratio was about 50 or more. This could correspond to the terrestrial value of 90. For twelve stars the abundance ratio was found to be remarkably constant, with a mean value of 3·4. It thus seems definitely established that the abundance ratio of C^{12} to C^{13} is different for different stellar atmospheres.

The work involving measurement of the total intensities of all the available absorption bands of the C_2 and CN violet systems for the three R-type stars H.D. 76396, H.D. 156074, and H.D. 182040 was completed and published. The stellar temperatures deduced from the band intensities varied from 3,900°K to 6,200°K, being in good accord with temperatures estimated by other investigators using quite different methods.

Stellar Atmospheres

Detailed analysis of high-dispersion spectra of the solar and K-type stars was continued. A study was made of the intensities of the Fe I lines in the spectrum of the supergiant star Epsilon Aurigae. Curves of growth were constructed for lines arising from normal and also from metastable levels. Small but probably real differences were detected which suggest a "dilution" of radiation in the atmosphere, though no such effect can be detected in the giant Alpha Persei. The curves of growth indicate a turbulent velocity of about 19 km/sec., but the broad profiles of the lines suggest a greater velocity, possibly a rotation of about 25 km/sec. The measurement of the intensities of Ti I and V I lines in the spectrum of the giant K5 star Gamma Draconis permitted the construction of well-defined curves of growth for several excitation potentials. Temperatures of 3,200°K for Ti I and 3,700°K for V I were deduced.

Detailed measures of the line intensities in the spectrum of Alpha Persei were made in order to study the character of its atmosphere and the transfer through it of radiation.

The Eclipsing Variable Zeta Aurigae

An extended series of spectrographic observations of the eclipsing variable Zeta Aurigae during the 1947-48 eclipse was studied. The measures of the intensities of the H and K lines of ionized calcium revealed an interesting and decided difference in the extent of the Ca II chromosphere of the giant K star at the times of ingress and egress of the small high-temperature companion. A comparison was made of the composite spectrum of Zeta Aurigae with that of the normal K-giant Arcturus. Value of Alpha, (α), the ratio of brightness of the B-type and K-type stars of the eclipsing binary, were deduced for every 100 Angstroms in the interval λλ5300-6500.

Polarization in Stellar Spectra

Polarization effects in stellar spectra were investigated. Spectra of four A-type stars were obtained, using a large Wollaston double-image prism of quartz mounted between the collinator and prism of the spectrograph on the 73-inch telescope. The results indicate no polarization and did not confirm the effect in the wing of the Hγ line reported by Ohman in 1935 for β Lyrae.

Absolute Magnitudes of the A-type Stars

In a study of the absolute magnitudes of the A-type stars, spectra were secured of a selected program of bright A-type stars whose trigonometric parallaxes were greater than 0".020 or 160 light years. When the measured intensities of the $H\gamma$ line were plotted against absolute magnitudes a strong correlation was found, indicating that the strength of this line may be used as a criterion of absolute magnitude. The addition of standards from visual binaries and galactic star clusters resulted in a successful calibration.

Maintenance of Equipment and Grounds

The extensive improvements to the Observatory grounds commenced last year were continued. The mile-and-a-half road from the main gate to the Observatory was repaired and resurfaced. Protective guard rails were installed at the "hair-pin" turn and staff parking space. A new Watchman fence was erected along the West Saanich road in front of the Observatory property. Some 2,800 feet of 2½-inch galvanized pipe lines were installed, increasing the number of fire hydrants to 15. To further reduce the fire hazard at the office building, the electrical wiring in the measuring room, photographic laboratory, and astronomers' rooms were replaced by Loomex cable.

New Instruments

A 14-inch Pratt and Whitney high precision lathe was added to the workshop. The aluminum body of the new spectrograph was received in February, but work upon it awaits the enlargement of the Dome workshop. Patterns for the counterweight bearings were made.

Public Relations

An estimated 26,300 persons visited the institution. The Observatory was opened to the public every week-day and public observation periods were held every Saturday night.

Special addresses were given to many of the organized groups and societies who visited the Observatory. Staff members delivered 19 lectures to scientific and educational groups in British Columbia and in the States of Washington and Oregon. Twenty-five staff seminars on technical subjects were held at the Observatory.

Seismology

Many earthquakes were recorded. Estimates of the distances and probable positions of the major shocks were made for newspapers in Victoria and Vancouver. The records were transmitted to the Dominion Observatory for detailed analysis. A new highly sensitive Benioff vertical instrument was installed.

Staff

The temporary appointment of Dr. Elsa van Dien, visiting Dutch astronomer, terminated June 30. The following scientists from Canadian and American universities carried out special research projects during the summer quarter: Dr. H. L. Welsh, Professor of Physics, University of Toronto; C. D. Maunsell, M.A., University of California; William Buscombe, M.A., University of Saskatchewan, and R. Kraft, A.B., University of Washington. F. T. Naish, B.A., University of British Columbia, ably assisted in the measurement and reduction of spectrograms.

Lands and Development Services Branch

R. A. Gibson, Director

There is steadily increasing interest in the Northwest Territories and in the Yukon Territory. Part of this is due to the opinion held by many that in the event of further wars this continent might be attacked by way of the Arctic. However, the chief reason is probably the certain knowledge that the north country is a vast storehouse of minerals awaiting development to meet the needs of the world.

Progress is being stimulated by scientific investigations. Geologists intensify the search for minerals. Topographers prepare maps. Biologists are securing the basic information upon which wildlife management policies can be developed. Foresters are establishing a more adequate system for the protection and development of forest resources. Scientists are studying the soil and giving encouragement to those who will use it for gardening. Weather stations have been established at strategic locations. Scientific investigations now include work in the fields of geophysics and terrestrial magnetism. Steps have been taken for the improvement of education in its broadest aspect to condition the native population for the ever-increasing contact with the outside world. Special attention is paid to nutrition and sanitation. People are being taught how to make the wisest use of what the country can produce.

The investment of capital for the opening up of mines is being encouraged. Conditions of work are being improved by co-operation of Government agencies with private enterprise. The laws are being modernized. Substantial Government expenditures on public services are being made. There has been quite an increase in mineral production. The search for base metals has been stimulated by the letting of concessions in the Mackenzie District of the Northwest Territories. Roads providing for more ready access to mineralized areas are well underway. Hydro-electric power from a Government-owned plant is being delivered to the Yellowknife field. Settlements are being helped to obtain more of the amenities of life in the way of improved educational facilities, pure water supply, medical and health services, sanitation, roads, landing fields, transportation and mail services, radio programs, and community halls. The present outlook indicates constructive progress.

The Northwest Territories Council, appointed by the Governor General in Council, is constituted as follows:

Commissioner	—Hugh L. Keenleyside
Deputy Commissioner	—Roy A. Gibson
Members of Council	—Stuart T. Wood
	—D. M. MacKay
	—John G. McNiven
	—Louis de la C. Audette
	—Harold B. Godwin
Secretary	—James G. Wright

Nine regular and twenty special sessions of the Council were held during the year. The volume of legislative work was considerable. A large number of ordinances were passed, and amendments made to many others to bring them into line with current conditions. A number of obsolete ordinances were repealed.

During the year, matters of policy were discussed in connection with the development of transportation, chiefly by road and water; transportation costs; education, including general policy, establishment of territorial schools, provision of welfare teachers, educational grants, adult education, and community recreation; medical, health, and hospital services, including a tuberculosis survey, hospital costs and grants, control of epidemics, and mercy flights; financial assistance of various kinds; legal control; administration of the liquor business; provision of electric power, water and sewage disposal at various points; postal facilities; management of wildlife resources; the Northwest Game Act and Regulations; the caribou survey; commercial fishing; reindeer project; trading permits; scientific work in the North; weather station program; licensing of radio stations; mining safety; co-ordination of Government construction; welfare institutions; Eastern Arctic Patrol; administration of Eskimo affairs; Family Allowances; allowances to aged Eskimos; motion pictures dealing with the Arctic; and assistance to organizations interested in northern development.

The Yukon Council met on July 7 and was prorogued on July 23, 1948. The following Ordinances were amended: Judicature, Workmen's Compensation, Gasoline Tax, Hospitals, Motor Vehicle, Bills of Sale, Hire Receipts and Conditional Sales of Goods, Assessment, Sale of Beer, Woodman's Lien, Chiropractic, Fire Prevention, Yukon Game, Vital Statistics, Yukon Medical, Partnership, and Co-operative Association Ordinances. The following new Ordinances were passed: Public Health, Amusement Tax, Old Age Pensions, and Yukon Corporation Income Tax Ordinances, an Ordinance to exempt Mayo Light Plant from Payment of Licence Fee; an Ordinance to authorize and implement the Federal-Territorial Agreement, and an Ordinance for the Granting of Supply.

The Yukon Council (elected in 1947) consisted of:

Dawson District—John R. Fraser, Dawson (died October, 1948).
Whitehorse District—R. Gordon Lee, Whitehorse.
Mayo District—Ernest J. Corp, Keno.

The Commissioner of the Yukon Territory is J. E. Gibben, K.C.

The administration of the National Parks during the fiscal year 1948-49 was featured by a greatly increased program of development. The appropriations provided by Parliament for new work and for maintenance were the largest since the establishment of the parks, and permitted a satisfactory beginning on a broad program of park highway improvement and extension as well as the development of other essential services. Excellent progress was made in the provision of additional tourist accommodation by private enterprise on sites made available by the National Parks Service. These services were augmented by improvements in the park camp-grounds and the extension of camping areas. Good progress was made in the development of Fundy Park in New Brunswick, the latest addition to the National Parks system. The National Parks hold first position as an attraction to tourists. Attendance at the National Parks was 1,362,994, the largest ever recorded in any one year. This figure represents an increase of 119,172 over the corresponding total for the year 1947-48, and was achieved in spite of conditions which interrupted or interfered with travel to many points in Western Canada. A great variety of entertainment was enjoyed and appreciated, according to the testimony of many who spoke or wrote of their experiences. A friendly welcome and fair treatment were available to all.

The forests and wildlife in the National Parks were protected and conserved. Scientific investigations and modern methods combined to aid in this essential task.

Historic Parks and Sites were visited by an increasing number of people. The significance of these historic places in the development of the nation is more generally appreciated. Every endeavour is being made to develop these properties suitably. The administration acknowledges the valuable advice obtained from the Historic Sites and Monuments Board of Canada.

In the National Parks and in the Northwest Territories the administration of wildlife resources has been based latterly on the results of scientific investigation. It has been difficult to recruit suitably trained biologists and some of those attracted to this Service have left to join university staffs or to carry on special work for other organizations in the wildlife field. In either case a valuable contact has been established. The Dominion Wildlife Service has obtained much useful help from the universities. Interest in the needs of the situation has been stimulated and it looks as though more specially qualified Canadian scientists will be available for these important activities. A wide range of investigation has been undertaken. In the migratory bird field valuable assistance has been had from the Fish and Wildlife Service of the United States.

A feature of wildlife administration in Canada is the yearly Dominion-Provincial Wildlife Conference, arranged by the Minister of Mines and Resources. Here wildlife policies are discussed by the officers who actually administer wildlife regulations, and the scientists sit in to advise and assist.

The resources of the Northwest Territories and of the Yukon are administered by the Dominion as separate and apart from the local administration of these Territories, following the arrangements which prevailed before the Prairie Provinces were given their resources. The lands are administered for development rather than revenue, although a substantial amount is collected. Mining is the principal activity, and, while production has been sustained, prospecting has fallen off. The construction of roads and power projects, the development of airfields, and improvement of settlements, has helped those who are investing capital in mining. The search for base metals in the Northwest Territories has been stimulated by the granting of concessions.

Dominion-owned land in the provinces which is no longer required for the purpose for which it was acquired is being placed on a revenue-producing basis.

The year's program completed was a great deal more extensive and varied than in any past year. It totalled $6,049,971.76 and embraced activities from coast to coast and as far north as the Yukon Territory and the Mackenzie District of the Northwest Territories. A total of $4,619,177.92 was expended on construction of new roads and bridges and preparing roads for hard-surfacing. Buildings were constructed in National Parks and on Indian Reserves, and a considerable number of smaller jobs were planned and carried to a satisfactory conclusion. The division also acted as engineering and architectural consultants in a great many instances.

There is still difficulty in recruiting satisfactory engineers and architects for departmental staffs, and the situation as to equipment, materials, and labour, is such that it is desirable to contract all work that can be handled in this way. Reasonably satisfactory results are being obtained.

The Branch is organized under the following divisions:

Director—R. A. Gibson.
Northwest Territories and Yukon Service
Chief, Yukon Division—C. K. LeCapelain.
Chief, Mackenzie Division—Mackay Meikle.
Chief, Arctic Division—J. G. Wright.
National Parks and Historic Sites Services
Controller—James Smart.
Dominion Wildlife Service, Chief—H. F. Lewis.
Lands Division, Chief—G. E. B. Sinclair.
Engineering and Construction Division,
Chief Engineer—T. S. Mills.

A summary of the activities of these divisions follows:

Northwest Territories and Yukon Services

Northwest Territories

The Northwest Territories comprise that part of the mainland of Canada lying north of the Provinces of Manitoba, Saskatchewan, Alberta, and British Columbia and east of Yukon Territory, the islands in Hudson and James Bays and in Hudson Strait, including Ungava Bay, and the vast Arctic Archipelago. The estimated total of land and fresh-water areas of the Northwest Territories is 1,304,903 square miles. According to the 1941 census, the population of the Territories was 12,028, including 2,284 whites, 4,334 Indians, 5,404 Eskimos, and 6 others, chiefly Asiatics. Recent population estimates give a total of 15,786, including 5,527 whites, 4,334 Indians, 5,923 Eskimos, and 2 Asiatics. The increase in white population is accounted for by renewed mining activity in the Mackenzie District.

The Commissioner of the Northwest Territories in Council has power to make ordinances for the government of the Northwest Territories relating to subjects designated by the Governor in Council, under the authority of the Northwest Territories Act. The seat of government is in Ottawa.

Administration

The Lands and Development Services Branch is responsible for administration of the various acts, ordinances, and regulations pertaining to the Northwest Territories. To facilitate departmental administration, there is a Chief of the Arctic Division and a Chief of the Mackenzie Division. A District Administrator stationed at Fort Smith, N.W.T., also serves as Superintendent of Wood Buffalo Park. The District Administrator is also Agent of Dominion Lands, Crown Timber Agent, Mining Recorder, Stipendiary Magistrate and Marriage Commissioner. The Sheriff of the Northwest Territories is also located at Fort Smith. A District Administrator is stationed at Aklavik and has general administrative jurisdiction over the area lying north of the Arctic Circle. The Mining Recorder, Agent of Dominion Lands, and Crown Timber Agent for the Yellowknife District, which includes what was formerly known as the Great Bear Lake Mining District, is situated at Yellowknife. The Mining Recorder for unorganized districts is located at Ottawa, and sub-mining recorders are located at Ottawa, Edmonton, Fort Simpson, Fort Norman, Aklavik, Coppermine, and Port Radium.

Medical Officers

Although the medical staff of the Department of Mines and Resources was absorbed by the Department of National Health and Welfare, the Government medical officers in the Territories continue to represent the Department of Mines and Resources in the administration of public health and other related ordinances, and also in the matter of the health of residents other than Indians and Eskimos. All doctors have been appointed coroners and medical health officers under provisions of the Public Health Ordinance. Some of the doctors patrol outlying areas, and all make use of the Northwest Territories radio system in prescribing for those who are unable to obtain treatment at the medical centre.

Hospitals

The Department of National Health and Welfare is responsible for the hospitalization of Indians and Eskimos.

Twelve hospitals were operated in the Northwest Territories during the year, nine by missions of the Roman Catholic Church and the Church of

England in Canada, one by a mining company at Port Radium, and one by private enterprise at Norman Wells. A new modern hospital is operated at Yellowknife by the Canadian Red Cross Society.

The mission hospitals are situated at Fort Smith, Fort Resolution, Hay River (sick bay), Fort Simpson, Aklavik (two), Rae, Chesterfield, and Pangnirtung. The Northwest Territories Administration pays the mission hospitals for the care of indigent whites and half-breeds admitted on the recommendation of the resident medical officer. The aged and infirm are cared for in industrial homes operated in conjunction with the mission hospitals at Aklavik, Chesterfield, and Pangnirtung. These inmates are also admitted on the recommendation of the Government medical officer, and the missions receive $400 per annum for their care and maintenance.

During the year, $36,405.87 was expended for the care of destitute patients in the hospitals. The industrial homes accommodated an average of 23 patients at a cost of $5,562.45.

Indigent patients from the Northwest Territories in institutions in the provinces were treated 8,934 days at a cost of $32,102.64. Of this, 5,643 days treatment were given to tuberculosis patients in the Charles Camsell Indian Hospital, Edmonton, Alberta, and 730 days treatment in the Central Alberta Sanatorium. Treatment was given to insane persons in the Provincial Mental Hospital, Ponoka, Alberta, for 1,825 days.

Schools

The education of white, Eskimo and half-breed children residing in the Northwest Territories is the responsibility of the Northwest Territories Council, which has set up a sub-committee on education to study ways and means of improving the educational system, including the provision of additional facilities.

Residential and day schools in the Northwest Territories are operated by the Church of England and the Roman Catholic Missions. Residential schools are located at Fort Resolution, Fort Providence, and Aklavik (two). Mission day schools are located in a number of settlements in the Territories. Owing to the nomadic tendencies of the natives, some of the day schools in the outlying areas are operated only when the natives are in the vicinity. During the year, 373 pupils attended the residential schools and 575 pupils attended the day schools.

New public schools have been erected at Fort Smith and Yellowknife by the Northwest Territories Administration. High school grades are taught in the Yellowknife school. These schools were attended by 214 pupils. The Administration plans to erect, during 1949, day schools at Aklavik, Fort Simpson, Fort Resolution, Coppermine, Coral Harbour on Southampton Island, Fort Chimo in Quebec, and to establish schools in conjunction with the Government nursing stations at Port Harrison, Quebec, and Lake Harbour on Baffin Island.

Indian children in the Territories are the responsibility of the Indian Affairs Branch. This Branch operates day schools at Fort Rae, Fort McPherson, Hay River, and Fort Norman, and has schools either under construction or projected at Rocher River, Arctic Red River, Fort Good Hope, and Fort Franklin. Many non-Indian children attend these schools.

The education program in the Mackenzie District is supervised by the Inspector of Schools, who is guided by instructions from Northwest Territories Council or Indian Affairs Branch. Educational costs are shared between the Northwest Territories Administration and the Indian Affairs Branch in the proportion of the racial origin of the children. The school at Yellowknife is run by the local school board with financial assistance from Northwest Territories Council.

The Northwest Territories Administration is responsible for the welfare of all Eskimos in the Northwest Territories and in the Eskimo territory of the Province of Quebec. Arrangements have been made to maintain a number of Eskimo children in the residential schools at Fort George, Quebec.

Grants totalling $50,571.69 were paid to maintain indigent children in the residential schools. Grants paid to mission day schools amounted to $4,037.50. School supplies and equipment were provided for schools, including the mission day schools, in Eskimo territory.

Correspondence courses obtained from the Alberta Department of Education were made available free of charge to all children residing in the Northwest Territories who requested them. The schools in the Northwest Territories follow the curriculum prescribed by the Alberta Department of Education.

All teachers employed in schools operated by the Department of Mines and Resources are Federal Government appointees. Their salary is determined by their qualifications and experience. In addition, they receive a living allowance. A new classification of Welfare Teachers is being introduced. Such teachers will give special leadership to community activities, carry out welfare duties after school hours, and remain at the settlements for the twelve-month period. Regular Civil Service superannuation benefits have been established for all teachers in Government day schools.

The Northwest Territories Administration has established scholarship awards and tuition grants to assist worthy students residing in the Territories. A School of Opportunity has been established at Yellowknife, where promising students from every community of the Northwest Territories may pursue higher studies. Manual training equipment and supplies are provided to the residential schools and shipments of films are made on a monthly basis to settlements in the Mackenzie District. School broadcast programs, specially prepared by the Canadian Broadcasting Corporation for audiences of school children across Canada, are re-broadcast over radio station CHAK at Aklavik.

All schools operating in the Mackenzie District of the Northwest Territories are inspected periodically by J. W. McKinnon, B.A., B.Paed, Inspector of Schools.

Liquor Permits

The Territorial Liquor Ordinance was revised and consolidated. The liquor stores at Yellowknife and Fort Smith continued in operation, with the Saskatchewan Liquor Board acting as agent for the Northwest Territories Administration. The gross business at the Yellowknife store decreased slightly over the previous year and the business at the Fort Smith store showed a substantial increase. Freight and insurance costs were reduced from the previous year.

Net profit from the operation of the liquor stores was $246,505.05 as compared to $196,370.57 in 1947-48. Profits from the Yellowknife store were $188,593.30 and from the Fort Smith store $57,911.75. Profits from liquor sales and permit fees in the Mackenzie District together with $1,960 derived from fines under the Territorial Liquor Ordinance and $201 from liquor permit fees paid to Ottawa were placed in the special liquor account for territorial purposes. Funds from this account are utilized for public welfare and other general improvements in the Northwest Territories.

During the fiscal year, 4,174 Class "A" annual permits and 23 Class "E" banquet permits were issued in the Northwest Territories. Four Class "B" permits covering sacramental wine and 65 Class "C" permits authorizing the importation of limited quantities of spirits, wine and beer were issued at Ottawa.

Sales at the territorial liquor stores were about 10,284 gallons of spirits, 1,460 gallons of wine, 6,700 gallons of ale and stout and 76,380 gallons of beer. Importation permits covered 131 gallons of spirits, 264 gallons of wine, and 144 barrels of beer.

Forest Protection

The weather throughout the 1948 fire season was distinctly unfavourable until the middle of August when abundant rainfall became general throughout the entire area. Prior to this date, a combination of strong winds, low humidity, and high temperatures produced peak fire-hazard conditions. This resulted in 65 fires which burned an area of 65,057 acres. These figures compare adversely with the statistics for the 1947 season when 26 fires were reported involving a burnt-over area of 39,545 acres. The following table gives a comparison of the pertinent statistics for the 1947-48 season.

	1947	*1948*	*Increase over 1947*
No. Fires Reported	26	65	39
Total Area Burned (acres)	39,545	65,057	25,512
Total Merchantable Timber Burned (acres)	6,239	7,625	1,386
Fire-Fighting Cost (Dollars)	4,273·52	15,157·48	10,883·96

It is thought that increased activity in the region contributed greatly to the increase in number of fires. Thirty of the fires reported were attributed to camp-fires left smouldering along settled water routes and trails. Of the remainder, lightning was responsible in 24 instances. The balance of outbreaks was attributed to miscellaneous causes.

A distinct improvement was noted over the previous year in reporting fires, which may account in part for the increased number recorded. Particularly is this true respecting reports received from commercial pilots and owners of chartered aircraft operating in the Territories. The co-operation extended from these sources resulted in suppression methods being applied much earlier than would otherwise have been the case and materially aided in controlling the extent of the fires. In this respect the co-operation of the R.C.A.F. Air Photo Squadrons has been obtained for the 1949 season.

Protection service was augmented during the 1948 season by the establishment of a six-man fire suppression crew. These men worked out of Fort Smith and were thoroughly trained in the operation of the mechanical equipment and in modern fire-fighting techniques. This small force performed invaluable work as a nucleus of local crews and frequently as total crew. When not employed on fire suppression duties the crew members were occupied with road construction or other useful employment.

Fire equipment was distributed at strategic locations. Eight complete fire-fighting units consisting of seven heavy pumps and one light pump were maintained at Fort Smith. These were constantly in use throughout the fire season.

Three units of fire fighting equipment were located at Yellowknife and one light unit was available during part of the season. These were all in frequent operation since the majority of fires occurred in this area.

In addition, single fire fighting units and tool caches were maintained at strategic points under the care of the R.C.M.P., and down-river wardens were provided with sufficient equipment to handle normal fire-season requirements. When the need arose this equipment was supplemented by the other units located at Yellowknife or Fort Smith.

A Fairchild "71" aircraft was in almost constant use ferrying men, equipment and supplies throughout the fire-season months. A Fox Moth aircraft, when available, was utilized for administrative and reconnaissance purposes. A chartered DeHaviland Beaver aircraft did not become available until near the close of the fire season, but it is considered that the use of this versatile aircraft in conjunction with the Fairchild will materially aid fire control measures during the 1949 season.

The new patrol boat, *M.B. Buffalo,* operated on the Slave and Peace Rivers in Wood Buffalo Park during the 1948 season as did the *M.B. Aspen* and *M.B. Pine.* In addition, water patrols were carried out on the lower Slave River by the *M.B. Caribou* and on the upper Slave by the *M.B. Beaver,* until the arrival of the *M.B. Buffalo.* The *M.B. Spruce* was stationed at Yellowknife and was operated in and around Great Slave Lake, while the *M.B. Moose* was made available to the Reindeer Station for fire patrols and administrative work.

The educational program for the conservation of forest and wildlife in the Territories was intensified during the 1948 season. The co-operation of agencies such as the armed forces, police, commercial airways, industries, schools, newspaper and radio advertising, with particular emphasis on auxiliary means of detection, was solicited. Motion pictures which stressed the need for the conservation of forests and game were exhibited to the inhabitants of the various settlements.

Wood Buffalo National Park

Two wardens were added to the staff of Wood Buffalo Park and two residences were constructed. One residence is located at 27th Base Line on the Athabasca River and the other on the Quatre Fourches Channel about four miles west of Fort Chipewyan, Alberta. The log cabin at Rocky Point on the Peace River was enlarged and repaired.

The present network of roads in Wood Buffalo Park is being extended and maintained to give better access and protection to those areas which are inaccessible by aircraft.

The advisability of transferring a small herd of elk from Elk Island National Park to Wood Buffalo Park was investigated. The mammalogists reported favourably on the project. The Birch River area has been selected as a favourable location for the experiment. A survey was made of Pine Lake and Seven Mile Lake where it is proposed to place trout fingerlings in 1949.

Eighty-three buffalo were killed to supply fresh meat for distribution to needy Indians and to hospitals operated in the interests of the Indians and halfbreeds. The hides are sold by tender.

W. A. Fuller, mammalogist, whose headquarters are at Fort Smith supplied the following reports on investigations in Wood Buffalo Park: barren-ground caribou survey; economic muskrat survey—Embarras Portage; report on transfer of beaver from Waskesiu to Wood Buffalo Park; status of the marten in Wood Buffalo Park and southern Mackenzie District; report on the feasibility of introducing elk into Wood Buffalo Park; measurements and diseases of buffalo; and a progress report on operations for the control of wolves in Wood Buffalo Park.

Reindeer

Reports from the Reindeer Station on the east side of the Mackenzie Delta show continued developments in the industry. At the roundups in the summer of 1948, there were 5,044 reindeer in the main herd located on the reserve and 1,562 animals in the subsidiary herd near Anderson River. A third herding unit was started in December 1948, by separating about 1,200 reindeer from the main herd and driving them to a selected location in the Eskimo Lakes area.

In November, 190 animals were slaughtered and total slaughter for the year was about 290 head. Meat and hides are used for native welfare. The usual donation of 100 carcasses was made to the mission hospitals and Residential schools at Aklavik. Revenue from the sale of reindeer products

amounted to $43.90 with a further $1,141 held over through delayed returns to be reported in the next fiscal year. Two hundred and fifty adult reindeer skins were shipped to the Eastern Arctic.

The Government reindeer enterprise began with the delivery, in 1935, of 2,370 reindeer driven overland from Alaska to the Canadian range. The training of Eskimos as herders is an important feature of the project. Herding methods are being developed to suit the local conditions and improved facilities for medical, educational and recreational services are being provided.

Commercial Fishing

Fifth largest on the continent, Great Slave Lake, Northwest Territories, 340 miles south of the Arctic Circle, has become one of the world's greatest inland commercial fishing areas. Commercial fishing in this area was first started in 1945.

Two separate commercial fishing operations were carried out at Great Slave Lake in the summer of 1948, one at Gros Cap and the other at Hay River. Though the season opened officially on June 15, the first lift at Gros Cap was not till June 23, and at Hay River operations were delayed until August 27 as the Grimshaw-Hay River road was impassable till then. The season closed on September 15. The limit for trout and whitefish is 2,500,000 lbs. dressed weight, and nearly 1,950,000 lbs. were taken. Of this, 1,140,000 lbs. were trout and 810,000 lbs. whitefish. In addition to this, 66,000 lbs. of inconnu and 3,700 lbs. of pickerel were caught.

During the winter fishing, 4,089,857 pounds of fish were taken by 302 licensed fishermen under special catch limits. A high standard of quality was maintained during the winter fishery and all shipments were inspected at Lower Hay River. Importers in Chicago, New York and Detroit spoke highly of the fine quality of the whitefish and trout from Great Slave Lake.

Eight firms, from Vancouver to Winnipeg, and several small independent operators, mobilized the fishermen, five aircraft, thirty snowmobiles, half-tracks and dog-teams to take the winter catch.

Amendments to the special fishery regulations of the Northwest Territories contain requirements to insure that commercial fishing firms operate at Great Slave Lake with adequate equipment so that the fish can be kept in good condition after being caught.

Yellowknife Administrative District

The Local Trustee Board of Yellowknife now has nine members, five elected locally, and four (including the Chairman) appointed by the Commissioner of the Northwest Territories. The Board held 41 meetings and passed several by-laws, including those covering such matters as poll tax, the regulation of motor liveries, assessment of property, and rate of taxation.

Public Improvements

Funds were provided for the Department of Public Works to construct a number of buildings in the Mackenzie District. These included an apartment building, liquor store and warehouses at Fort Smith, warden's residence at Fort Liard, and an administration-apartment building at Aklavik.

A four-classroom public day school was built at Fort Smith and two welfare teachers commenced classes in September. This modern building will also serve as a community centre for the residents. At Yellowknife an eight-room day and high school, which would also be available for pupils

from the Mackenzie District was completed at a cost of $211,000, provided by the Northwest Territories Administration. Some materials were delivered to Coppermine on the Arctic Coast for a two-classroom day school with teacherage, in which accommodation will be provided for the Royal Canadian Mounted Police. A four-classroom day school with teacherage was built at Hay River settlement on the Great Slave Lake by the Indian Affairs Branch for native and white children of the settlement. Because of the delay in completing the building it was only possible to appoint one teacher, who commenced classes during the winter. Arrangements were made by the Indian Affairs Branch for the construction of two-classroom day schools with teacherage, at Rocher River, Fort Norman, Fort Good Hope, Arctic Red River and Fort Franklin. All these school buildings are or will be constructed so as to be available for community purposes.

A modern well-equipped forty-bed hospital was built at Yellowknife by the Red Cross Society towards which the Northwest Territories Administration made an overall grant of $125,436.

The pure-water and sewage systems commenced in 1946 were sufficiently completed so that service could be provided on a limited scale in December. This is a pressure-circulating, heated and chlorinated water system designed to overcome the difficulties encountered in the permanently frozen sub-soil at Yellowknife.

The Dominion Government contributed $69,000 towards the construction of roads, streets and sidewalks in Yellowknife Settlement on the understanding that the local administrative district will be responsible for their maintenance. Gravelled roads were also constructed in Hay River Settlement with funds provided by the Administration. The Mackenzie highway, which is an all-weather gravelled road from Grimshaw, Alberta, to Hay River Settlement, Great Slave Lake, was completed. It is 385 miles long, of which 81·2 miles are in the Northwest Territories. A 154-mile winter truck road was built late in the year from Hay River to Yellowknife by way of the west shore and the first freight arrived by truck at Yellowknife on March 14. Because of the winter conditions under which this road was built it was not possible to complete it to the standards required.

The power development at Snare River was completed and delivery of power to mines at Yellowknife was commenced in October. This power development, designed to provide 8,000 h.p. under 56-foot head, and the 90-mile transmission line from Snare River to Yellowknife were constructed under supervision of the Northwest Territories Power Commission.

The Department of Transport continued maintenance of aids to navigation along parts of the Mackenzie River waterway, including buoys on Great Slave Lake, Mackenzie River and Great Bear River and Lake. In 1948 three new battery-operated electric lights and one electrically lighted buoy were established. A radio telephone is being installed on the Aids to Navigation workboat *Pilot II* to facilitate the servicing of lights and immediate correction of reported deficiencies. The aids presently maintained are: Great Slave Lake—17 lights, 4 pairs of range lights and 5 lighted buoys; Great Bear Lake—6 lights, 1 pair of range lights.

Unlighted buoys and markers suitable to available depths are maintained. The Civil Aviation Division, Department of Transport, commenced development of a landing strip at Aklavik and maintained airports at other points.

Thirty-eight meteorological stations were maintained in the Northwest Territories by the Meteorological Division, Department of Transport. These include three new stations, one on Isachsen Island, one at Mould Bay, Prince Patrick Island, both of which are in the Arctic Archipelago, and the third at Fort Reliance at the eastern end of Great Slave Lake. The station at Wrigley Airport which has been out of operation, was reactivated.

Scientific Surveys

Thirty-two of the 38 reporting stations in the Northwest Territories are telegraph reporting stations and six are climatological stations which report by mail only. Thirteen of the telegraph reporting stations take radiosonde ascents and five make pilot balloon observations of the upper air. The Radio Division of the Department of Transport, the Royal Canadian Corps of Signals and the Government Telegraph Service co-operated with the Meteorological Division in maintaining radio communications from weather stations. The Hudson's Bay Company continued to co-operate with the Meteorological Division in observing and recording meteorological information and communicating it via their own radio system. The Radio Division, Department of Transport, established Ionospheric stations at Baker Lake and Resolute Bay.

The Bureau of Mines continued studies on the treatment of complex gold ores occurring in the Yellowknife area and succeeded in solving several of the problems that had formerly baffled the operators. The analysis of samples of radioactive ores and the development of new processes for the extraction of uranium were also undertaken by the Bureau.

The program of the Geological Survey of Canada included the mapping of seven areas in the Yellowknife Mining District. Four of these, aggregating about 8,000 square miles, were mapped for publication at a scale of 1 inch to 4 miles. Detailed mapping at field scales of 1 inch to 500 or 800 feet was undertaken in three areas. The resident geologist at Yellowknife visited most of the active and new properties and prospects throughout the District and maintained close liaison between the mining industry and the Geological Survey.

The Surveys and Mapping Bureau completed 160 miles of township outline control surveys in the Mackenzie River valley. Eighty miles lie in the vicinity of Fort Wrigley and the remainder in the upper Mackenzie towards Great Slave Lake. Twenty-four astronomic fixes were made in the Districts of Keewatin and Franklin, and control for the planimetric mapping of 2,080 square miles for a publication scale of 1 mile to 1 inch was laid down.

Four parties from the Geographical Bureau worked in the Northwest Territories, two of which made studies in the Eastern and Western Arctic. A third studied navigation and settlement conditions along the Hudson's Bay Company's supply route through the western Arctic and the fourth carried out detailed geographical investigations of the Thelon River drainage basin.

The Division of Terrestrial Magnetism of the Dominion Observatory had four parties in the Arctic Islands and Hudson Bay carrying out magnetic observations. The new location of the North Magnetic Pole was confirmed. A new temporary magnetic observatory was established at Resolute Bay which will be manned continuously for the next few years in order to record changes in the magnetic field in this region. A party from the National Museum studied Eskimo sites and the present Eskimo population at Frobisher Bay, Baffin Island.

During construction of the hydro-electric development on the Snare River, the Dominion Water and Power Bureau supplied engineering advice and service. Six gauging stations were maintained throughout the year on rivers flowing from the north into Great Slave Lake.

Agriculture

Climatic and soil conditions throughout most of the Northwest Territories are not suitable for commercial agriculture. Existing agricultural production is confined mainly to vegetable gardens at trading posts and missions along the Mackenzie River system, with a few small farms at some of the more southerly settlements. With the exception of potatoes, the main crop grown, agricultural production in the Territories does not meet local demand.

With a view to stimulating greater production of vegetables, and possibly of other farm produce, the Dominion Experimental Farms Service established an experimental sub-station at Simpson in 1946. On these 85 acres, experiments are in progress to determine what systems of garden and farm production are suitable to the district. This work includes tests of different varieties of vegetables, small fruits, forage crops and cereals; the use of manure and fertilizers; tillage experiments; irrigation by pumping water from the river, and a limited amount of work with live-stock and poultry. In addition to the work at Simpson, co-operative trials, mostly with vegetables, are conducted at Yellowknife and other points on the Mackenzie River system, including Fort Smith, Providence, Trout River, Norman Wells, Fort Good Hope and Aklavik. The officer in charge of the Simpson Sub-Station visited each of the foregoing points, to arrange with co-operators for experimental work, and to advise local residents on problems of garden management and crop production. For the summer months two student assistants were employed to assist the officer-in-charge in the experimental projects, one being located at Simpson and the other at Yellowknife. Both at Simpson and at Yellowknife progress was made in erecting buildings necessary for this program.

Eastern Arctic Patrol

The loss of the R.M.S. *Nascopie* in 1947 necessitated radical changes in the organization of the Patrol. Six small motor vessels in additions to the *C.G.S., N.B. McLean,* schooners, and Peterhead boats, were used to carry supplies to Eastern Arctic posts. The motor vessels were the *Terra Nova, Clarenville, Earle Trader* and *Eskimo* operated by the Hudson's Bay Company, the *Ice Hunter* operated by the Baffin Trading Company, and the *Regina Polaris* operated by the Hudson Bay Vicariate Transport Limited.

The *M.V. Regina Polaris* sailed from Montreal on July 10. The small Government party on board included S. J. Bailey and an educationalist of the Northwest Territories Administration, Dr. H. W. Lewis, Medical Officer, and a dentist from the Department of National Health and Welfare. The ship proceeded directly to Chesterfield, N.W.T., discharged her cargo, and spent the rest of the summer on trips out of Churchill, Manitoba, to Baker Lake and points in Hudson Bay, Hudson Strait, and Ungava Bay, returning to Quebec on October 8.

The *Terra Nova,* loaded with Government supplies, sailed from Montreal on August 8 with Alexander Stevenson, Administrative Officer of the Northwest Territories Administration, on board, and visited northern Baffin Island and Devon Island, calling at River Clyde, Pond Inlet, Arctic Bay, Dundas Harbour, and Pangnirtung. The vessel reached Churchill on September 9 and loaded supplies for the Hudson Bay and Strait region for delivery on her homeward voyage. The *Fort Severn,* a small schooner operated by the Hudson's Bay Company out of Churchill, serviced Igloolik and assisted the larger vessels in freighting to the west coast of Hudson Bay.

At all ports of call officers of the Administration investigated and reported on such matters as Eskimo economy, food and health conditions, trading, administration of Family Allowances, relief and Old Age Allowances, education and social conditions, vital statistics, and items of general administration. These officers also looked after postal matters for the Post Office Department and citizenship matters for the Secretary of State Department.

The Baffin Island section of the patrol found Eskimo economy and health conditions to be good although it had been a rather poor fur year. Wildlife resources of the land and sea seemed adequate and the natives had not suffered from the scarcity of fur. The Hudson Bay and Ungava Bay sections

of the patrol found the native economy, health, and food resources to be good for the most part although some of the Eskimos on the Quebec coast were experiencing a scarcity of country produce.

At all points it was found that Family Allowances, which are paid in kind to the Eskimos, were being efficiently handled. As a result, the children are better fed and clothed than in previous years. During the year the Northwest Territories Council authorized the payment of an Old Age Allowance of $8 per month to all Eskimos over 70 years of age. Forms for the registration of these aged people were left at all posts. Many individual welfare problems were dealt with and it was found that the administration of Government relief to indigent widows, orphans, and the aged and infirm, was being well handled.

The educational officer of the Administration reported on the educational needs of the Eskimo as a basis for planning an expanded program of education to fit them to meet changing conditions and the encroachment of civilization upon the region. It was found that the Book of Wisdom, an educational booklet prepared in Eskimo syllabic script and distributed by the Administration in 1947, is keenly appreciated by the Eskimo people.

Yukon Territory

Yukon Territory comprises the extreme northwestern part of the mainland of Canada, and has an area of 207,076 square miles. It is bounded on the north by the Arctic Ocean; on the east by Mackenzie District of the Northwest Territories; on the south by British Columbia (latitude 60 degrees north) and the United States Territory of Alaska; and on the west by Alaska (longitude 141 degrees west).

Most of the Yukon's population is found in the southern part of the Territory. According to the 1941 census, the population of Yukon Territory was 4,914. This figure has been increased by new developments, including a revival of the mining industry. The most recent estimate places the population of the Territory at 7,512, composed of 5,927 whites and 1,585 Indians.

The Yukon was created a separate territory in June 1898. The local government consists of a chief executive, the Commissioner, and an elective Legislative Council of three members with a three-year tenure of office. The Commissioner administers Government measures, and works under instructions from the Governor in Council or the Minister of Mines and Resources. The Commissioner in Council has power to make ordinances dealing with the imposition of local taxes, sale of liquor, preservation of game, establishment of territorial offices, maintenance of prisons and municipal institutions, issue of licences, incorporation of companies, solemnization of marriages, property and civil rights, administration of justice, and generally all matters of a local and private nature in the Territory. The seat of government is at Dawson, Y.T.

Territorial Council

The Commissioner of Yukon Territory is J. E. Gibben, K.C., Dawson. The Yukon Territorial Council, elected by acclamation for a three-year term in 1947, was composed as follows: Mayo District, Ernest J. Corp, Keno Hill; Whitehorse District, R. Gordon Lee, Whitehorse; and Dawson District, John R. Fraser, Dawson.

Work of Council

The work of the Council has increased in recent years by the need of the Councillors to give consideration to legislation designed to meet the new conditions caused by the greater activity in the Territory and to implement the financial agreement with the Dominion.

The Yukon Council met on July 7 and was prorogued on July 23. Details of the business transacted are contained in the Introduction to this Section.

The Council met again on March 30 to vote supply and to consider non-contentious legislation needed for the proper administration of the Territory. As the session carried over into the 1949-50 fiscal year its work will be noted in the report for that year.

Territorial Administration, Revenue and Expenditures

The Commissioner was relieved of much detailed work by the appointment of C. E. Becker, K.C., as Public Administrator and the appointment of a Deputy Registrar of Land Titles and a Legal Adviser to the Territorial Government. This arrangement enabled him to devote more time to his administration tasks. The vacant positions of Territorial Treasurer and Secretary were filled by the appointment of W. A. Wardrop.

Revenue collected under Territorial Government Ordinances was $177,511.56. The amount transferred from the liquor account was $260,000. A grant of $199,470.81 was made to the Yukon Council by the Dominion Government and $148,673.95 was drawn from surplus account. Territorial Government expenditures for the year were $785,656.32.

Finance

A financial agreement between the Government of Canada and the Government of the Yukon Territory, similar to existing Dominion-Provincial Agreements, and patterned on that between Canada and British Columbia, was signed on September 14, 1948. Under its terms, the Government of the Yukon Territory resigned its right to levy income taxes and to collect succession duties, and in return will receive an annual grant from the Federal Government. This agreement enables the Territorial Government to plan the financing and administration of its responsibilities on a sounder basis than had been possible previously.

A qualified land appraiser from Vancouver was engaged to make an assessment survey which would serve as a basis for an equitable system of property taxation in the Yukon.

Municipal Expansion and General Construction

An additional subdivision to the south of Whitehorse was surveyed to provide building sites for the increasing population. Discussions are under way for the incorporation of Whitehorse as a town.

The Territorial Government spent $211,005.77 on roads, bridges, and public works. The greater part of this sum was for the maintenance and construction of mining roads.

Health and Welfare

The Yukon Territorial Government spent $207,976.16 on hospitals, charities and public welfare, an increase of $30,850.66 over the preceding year. Included in the total were: care of indigents, mostly aged persons, $54,222.56; child welfare, $11,032.36; and grants to hospitals, $134,396.47. The hospital grants were divided as follows: Whitehorse General Hospital, $35,000; Mayo General Hospital, $14,342.70; and St. Mary's Hospital, Dawson, $85,053.77.

Registrations under the Vital Statistics Ordinance during the year were: births, 400; marriages, 77; and deaths, 71. The number of births increased by 59, over the previous year.

A tubercular X-ray survey was undertaken in conjunction with the Indian Affairs Branch, and 1,392 plates were taken at a cost of $2,002.14 to the Territorial Government. Detection and control of venereal disease was carried out by Medical Health Officers with the assistance of facilities at the three hospitals within the Territory.

Health Officers were stationed at Dawson, Mayo and Whitehorse, and their duties were defined by the revised Public Health Ordinance passed in July. They also gave medical care to persons in receipt of assistance from the Territorial Government at a cost of $4,899.98. The Public Health Ordinance of 1948 also provided for the appointment of a Sanitary Inspector to assist the Health Officers and this position was filled in February.

Education

Expenditures on education by the Territorial Government were $114,858.20, an increase of $10,153.05 over the previous year. There were 500 pupils enrolled in the Territory's ten schools and daily attendance averaged 448, or 89·6 per cent. Twenty teachers were employed, most of them holders of first-class British Columbia or Alberta certificates. One new school was opened at Teslin.

Arrangements were made with the Royal Canadian Corps of Signals to broadcast recordings of the national school broadcasts over the Army-operated radio stations CFWH at Whitehorse and CFYT at Dawson.

Law and Order

Law and order have been well maintained throughout the Territory by the Royal Canadian Mounted Police.

The Juvenile Delinquents Act, which was proclaimed in the City of Dawson and the taxation area of Whitehorse in 1947, was extended in 1948 to include that portion of the mining districts of Dawson and Mayo south of the sixty-sixth parallel of north latitude, and the mining district of Whitehorse. The necessity of trying the Territory's rare cases of juvenile delinquency under the Criminal Code has thus been obviated.

Fur and Game

The number of pelts taken of the more valuable furs such as muskrat, lynx, marten, mink, weasel, otter and fox declined, and fisher, wolverine and coyote increased slightly. There was a close season on beaver. There were 138,468 squirrel pelts exported, as compared with 64,834 in 1947.

Revenue collected under the Fur Export Tax was $11,407.51. Bounty payments for wolves and coyotes amounted to $10,320, a decrease of $630 from the previous year.

Federal Administration

The Lands and Development Services Branch of the Department at Ottawa is responsible for the transaction of business arising from the general administration of the Territory under the Yukon Act and ordinances passed by the Territorial Council, and for the administration of natural resources.

The Department continued its program for the development of the natural resources and administration of the Territory. A start was made on its long-term plan to convert the Whitehorse-Mayo-Dawson trail into an all-weather road and $400,000 was spent in constructing the first 28 miles on the Minto-Mayo section and in laying in supplies and equipment to enable an early start to be made during the next fiscal year.

Scientific Surveys

The Federal Government continued to survey and map the Territory and 26 parties were engaged on ground field work. The Geological Survey had three parties engaged in the geological study of the Whitehorse, Dezadeash and McQuesten areas, and one party commenced a detailed study of the geology and mineral deposits of Keno and Galena Hills. From the Geodetic Survey, one party continued first order triangulation easterly from Whitehorse in the vicinity of the Alaska Highway, and a network of approximately 100 miles of triangulation for mapping control was completed. A second party completed 120 miles of semi-precise traverse of the Whitehorse-Dawson Trail from its junction with the Alaska Highway, 20 miles west of Whitehorse. A third party ran 166 miles of precise levels along the Haines Cut-off and the Carcross-Tagish-Jake's Corner road. Legal Surveys surveyed the right of way of the Whitehorse-Carcross road; made miscellaneous lot surveys at Ross River, Tagish, Whitehorse, Mayo and Teslin; surveyed 56 mineral claims at Mayo; and located and monumented 36 miles of the Yukon-British Columbia boundary between longitudes 129° and 130°. Twelve parties from Topographical Surveys surveyed 26,700 square miles by photo-topographical methods for publication at the scale of 4 miles to 1 inch and 1,052 square miles for publication at the scale of 1 mile to 1 inch. These surveys were supplemented by five parties from the Canadian Army Survey Establishment. In addition, the Royal Canadian Air Force continued its program of aerial photography to assist in mapping the Territory.

Archaeological work was carried out in the Yukon by three members of the staff of the National Museum, and botanical collections were made in the McQuesten district by one member of the National Museum staff.

The Alaska Highway

The maintenance of the Alaska Highway, access roads to airports along the Northwest Staging Route, and flight strips bordering the highway, was under the jurisdiction of the Department of National Defence (Canadian Army). The highway was open for traffic throughout the year. Several temporary wooden bridges built by the United States Army during the war were replaced by permanent structures.

Airports along the Northwest Staging Route continued to be maintained by the Royal Canadian Air Force, and flight strips bordering the highway were serviced by the Royal Canadian Engineers. The Northwest Communication System, comprising the telephone and telegraph systems paralleling the highway, was operated by Canadian National Telegraphs under the administration of the Department of Transport. It provides facilities for public long-distance telephone and commercial services at a number of repeater stations along the highway. In addition, this system ties in with other Department of Transport lines of communication at Fort St. John, Beatton River, Fort Nelson, Smith River, Watson Lake, Teslin, Whitehorse, Aishihik, and Snag.

During the year, five lunch-stops and three overnight camp-grounds were provided by the Lands and Development Services Branch for the accommodation of the travelling public. This brings to ten the total number of overnight camp-grounds established at scenic points along the highway in Yukon Territory.

Bus services were operated regularly on the highway between Dawson Creek and Whitehorse by the British Yukon Navigation Company, and between Whitehorse and Fairbanks by the British Yukon Navigation Company and the O'Harra Bus Lines. Facilities for the repair and maintenance of motor vehicles continued to increase in number and to offer improved service. The Haines Cut-Off Road was open for traffic during the summer months only.

Canol Project

Dismantling of the 4-inch pipeline from Norman Wells, Northwest Territories to Whitehorse, Yukon Territory, was continued. Transfer of the oil refinery from Whitehorse to Edmonton was completed by Imperial Oil Limited. Pipelines from Skagway to Whitehorse and from Whitehorse to Fairbanks, constructed as part of the Canol Project, were operated under an agreement between the Government of the United States and the White Pass and Yukon Route and its subsidiaries. The line from Skagway to Whitehorse reduced the transportation cost of fuel oil.

Forest Protection

Forest fire protection in Yukon Territory has been confined generally to areas accessible from the Alaska Highway and the connecting road system. The present aim is to extend the protection service in line with road construction.

During the 1948 season, 15 forest fires were recorded in Yukon Territory, as compared with 21 in the preceding year. However, suppression costs climbed to $14,509.58, as compared to $470.14 in 1947. Two serious outbreaks, one in the vicinity of Mendenhall Creek, and the other adjacent to the railroad right of way at Carcross, accounted for 97·5 per cent of the area burned and 93 per cent of the fire-fighting costs. The following table shows a comparison of the forest fire statistics for the past two years:

	1947	1948
Number of fires reported	21	15
Total area burned (acres)	1,675	55,820
Total merchantable timber burned (acres)	645	50,911
Fire-fighting costs	$470.14	$14,509.58

Eight fires occurred during June when weather conditions created an abnormally high fire hazard. Nine of the 15 fires reported were attributed to carelessness on the part of smokers and campers. Three were caused by sparks from locomotives, one by flying embers from a burning building, one from slash-burning operations, and one was of unknown origin.

Constant fire patrols were made along the Alaska Highway and connecting roads during the fire-season months. In addition, the education program for the conservation of forests was intensified. Motion pictures which stressed the need for forest protection were exhibited in schools and camps throughout the Territory. Ten of the fires were reported by residents, indicating an increasing fire-consciousness.

Organizations such as commercial transport companies, the Royal Canadian Mounted Police, the Canadian Army and the Royal Canadian Air Force continued to co-operate in preventing, detecting, and reporting forest fires. The forest protection organization was strengthened by additional fire pumps, hose, short wave two-way radios, small tools, and a 3-ton truck. Fire-fighting equipment was provided the contractor on the construction of the Minto-Mayo section of road.

The Forester in charge of forest protection continued to assist the Crown Timber and Land Agent at Whitehorse in the administration of timber and public lands in southern Yukon.

Hydro-Electric Developments

The practicability of developing hydro-electric power on the Mayo River to serve the mining industry of the neighbouring area was investigated.

An application to develop a power site on Porter Creek, about seven miles northwest of Whitehorse, was received from the Yukon Electrical Company

which serves Whitehorse and vicinity. The proposed development, involving storage on two small lakes and a diversion of Fish Creek, would have an initial capacity of 400 h.p. under 420-foot head. Following an inspection and a favourable report by an engineer of the Dominion Water and Power Bureau, the issue of an interim licence was recommended and a draft was prepared for departmental approval. Throughout the year, five stream-gauging stations were maintained in the Yukon by the Bureau, which has a sub-office at Whitehorse.

Mining

The mining industry had a successful year despite transportation difficulties. Preliminary figures for mineral production are: gold, mostly placer, 60,614 ounces; silver, 1,718,618 ounces; lead, 4,598,665 pounds; zinc, 493,469 pounds, and coal, 1,535 tons.

The development of the Tantalus Butte Coal Mine near Carmacks continued with financial assistance from the Federal Government. Transportation difficulties curtailed production plans and in September the mine was closed for the winter. During the production period, 1,535 tons of coal were mined and delivered to markets, as compared to approximately 250 tons in the previous year. The coal was of good quality and the supply eased to a great extent the shortage of wood fuel, particularly in Dawson and Mayo. Discussions have been held and plans made to improve transportation facilities and to find new markets for increased coal production.

Active prospecting by large mining companies and individual prospectors continued throughout the Territory. Interest centred primarily on the search for base metals.

Agriculture

The Dominion Experimental Substation on the Alaska Highway 100 miles west of Whitehorse continued its activities to discover suitable agricultural products which would enable the Territory to be self-supporting as far as possible in the production of food. The substation harvested its first crops in 1946 and by 1948 feeds and grain had been cultivated to such an extent that poultry and a small herd of dual-purpose cattle were added to the farm stock. Winter varieties of wheat and rye sown in August, 1947, produced an excellent first crop in August, 1948.

The officer in charge of the substation visited most settled parts of the Territory. The season was normal and garden products were well up to standard.

National Parks Service

Canada's National Parks System now comprises seventeen National Parks, and nine National Historic Parks. The parks are administered under the authority of the National Parks Act and Regulations.

An area of 21 square miles was withdrawn from Banff National Park and returned to the Province of Alberta to facilitate development of a hydro-electric project adjacent to the park boundary. A small area was also withdrawn from Elk Island Park to provide an additional right-of-way for Provincial Highway No. 16, which crosses the park from east to west. The new national park in New Brunswick was re-named "Fundy National Park" by Parliament, in compliance with a request from the province. Inspections of proposed additions to the National Parks system in British Columbia were undertaken and reports prepared. The total area now included in National Parks is 29,146 square miles and the area in National Historic Parks is 735 acres.

A large increase in appropriations for maintenance and development resulted in a good start on highway improvement, as well as the extension of other essential services held in abeyance during the war years when funds were not available. Extensions to tourist accommodation were made by private enterprise on sites made available by the Department. Public campgrounds in the parks, which are widely used by visitors carrying their own camping equipment, were also improved and extended. In Fundy Park in New Brunswick, a program of road and building construction and development of recreational facilities was undertaken.

The existence of freehold or alienated lands within the outer boundaries of some of the national parks is a matter of increasing concern. These properties were originally acquired by the owners prior to the establishment of the parks and their retention or development by private enterprise raises difficulties in park administration, particularly in cases where mineral rights are involved. During the year the Department arranged to purchase one small area required for highway purposes.

Travel to the Parks

Attendance at the National Parks was 1,362,994, the greatest number of visitors ever recorded in any fiscal year. This figure represents an increase of 119,172 over the previous year, and was achieved in spite of adverse weather conditions which interrupted or interfered with travel to many points in Western Canada. The number of visitors to each park, and comparative figures for the previous year, will be found in the following table.

Comparative Statement of Visitors to the National Parks from April 1 to March 31

National Parks	*1948-49*	*1947-48*	*Increase or Decrease*
Banff	391,294	326,573	+ 64,721
Cape Breton Highlands	25,769	27,507	— 1,738
Elk Island	66,541	45,615	+ 20,926
Georgian Bay Islands	6,794	4,778	+ 2,016
Glacier	626	839	— 213
Jasper	72,392	71,957	+ 435
Kootenay	68,276	77,805	— 9,529
Mount Revelstoke	12,795	11,053	+ 1,742
Point Pelee	133,189	109,354	+ 23,835
Prince Albert	38,048	34,371	+ 3,677
Prince Edward Island	84,333	67,508	+ 16,825
Riding Mountain	213,328	184,778	+ 28,550
St. Lawrence Islands	27,154	14,299	+ 12,855
Waterton Lakes	86,717	147,177	— 60,460
Yoho	34,654	31,085	+ 3,569
Sub-total	1,261,910	1,154,699	+ 107,211
National Historic Parks			
Fort Anne	14,547	11,980	+ 2,567
Fort Beauséjour	19,007	16,397	+ 2,610
Fort Chambly	28,319	26,703	+ 1,616
Fort Lennox	2,830	1,303	+ 1,527
Fortress of Louisbourg	5,012	4,858	+ 154
Fort Malden	14,004	14,065	— 61
Fort Wellington	8,390	5,800	+ 2,590
Port Royal Habitation	8,975	8,017	+ 958
Sub-total	101,084	89,123	+ 11,961
GRAND TOTAL	1,362,994	1,243,822	+ 119,172

Special Events

Events of special interest included trail riding, trail hiking and mountaineering expeditions, golf and tennis tournaments, regattas, ski meets, and winter carnivals. In addition, many organizations from places in Canada and the United States held conventions or meetings in the National Parks.

Their Excellencies, The Governor General of Canada and Viscountess Alexander of Tunis, with their family, spent part of the months of July and August at Dalvay House in Prince Edward Island National Park, where they were guests of the Province. The Alpine Club of Canada held its annual camp at Peyto Lake in Banff Park during the latter part of July and early August with a record attendance which necessitated extending the duration of the meet. The Skyline Trail Hikers and Trail Riders of the Canadian Rockies organizations sponsored supervised outings in Banff Park. Two special tours were carried out for newspaper editors in Banff, Jasper, Elk Island, Yoho and Waterton Lakes Parks, under the auspices of the Pacific Northwest Travel Association in July and August. Open golf tournaments were held in Banff, Jasper, Prince Albert and Riding Mountain National Parks, which attracted large entries. The Saskatchewan Provincial Tennis Championships were held at Waskesiu, in Prince Albert National Park during the latter part of July.

The annual winter carnival and bonspiel featured the winter sports season in Banff Park. A new chair-lift erected late in 1948 on the slopes of Mount Norquay, overlooking the town of Banff, was officially opened in December by the Hon. James A. MacKinnon, Minister of Mines and Resources. The famous "Nels Nelson" ski jump and hill on the slopes of Mount Revelstoke were reconstructed and were officially opened at a special competition early in the winter.

Publicity and Information

The work of making known the beauties and attractions of the National Parks was continued by the Editorial and Information Division of the Department. This was achieved by the distribution of illustrated booklets, folders and press articles, and by the use of motion picture films, slides, lectures, and exhibits. In this work, valuable assistance is extended to the Department by the National Film Board, the Canadian Government Exhibition Commission, and the Canadian Government Travel Bureau. To meet the demands for printed material descriptive of the National Parks more than 90,000 illustrated booklets and 310,676 folders were distributed. These were made available to the superintendents of the various parks, provincial tourist bureaus and other travel agencies. In addition to the above, five booklets and nine leaflets describing National Historic Parks and Sites in Canada were distributed in quantity in response to inquiries. Of these publications three were issued for the first time: "National Historic Parks and Sites in Quebec" (French and English editions); "Fort Malden National Historic Park"; and "The Fortress of Louisbourg". Anglers Guides to Banff, Jasper, Waterton Lakes, Prince Albert, Yoho, Kootenay and Mount Revelstoke Parks were also made available to visitors desiring to fish in the waters of these parks.

Three new 16 mm. coloured sound films known as the "Holiday Series" which depict scenes in the National Parks in Eastern Canada, were completed by the National Film Board. These subjects include "Holiday Island", "Island Holiday", and "Seaside Holiday" describing respectively Georgian Bay Islands, Cape Breton Highlands and Prince Edward Island National Parks. Thirty prints of each of these film subjects were purchased for distribution in Canada through outlets of the National Film Board and an additional 62 prints of each were purchased by the Canadian Government Travel Bureau for distribution in the United States.

Special displays featuring the National Parks were constructed and installed by the Canadian Government Exhibition Commission at the Pacific National Exhibition at Vancouver, B.C.; the Canadian National Exhibition at Toronto; and the Western Fair at London, Ontario. Other National Park displays were arranged in co-operation with the Canadian Government Travel Bureau at travel and sportsmen's shows held during the winter at Seattle, and San Francisco. Representatives of the National Parks Service were in attendance at these exhibitions to furnish special information. In addition, the superintendent of camp-grounds and recreation at Prince Albert National Park undertook a special lecture tour in the cities and larger towns of Saskatchewan, during which the National Park films were exhibited and brief addresses outlining the attractions of the National Parks were made.

Close co-operation was maintained during the year with travel and other agencies and assistance rendered promptly in meeting requests for material concerning the National Parks.

Maintenance and Improvements

Roads and Bridges

A large proportion of the highway development was undertaken in the mountain parks of Alberta and British Columbia. In Jasper Park sections of the Banff-Jasper Highway were widened to 26 feet and a base of crushed gravel applied. Grades and alignment were extensively revised. Approximately 18 miles were rough-graded and 14·5 miles fine-graded and gravelled. On the Jasper-Edmonton Highway, 29 miles were rough-graded, 27·5 miles fine-graded, and 24·15 miles gravelled. The road was also widened to 32 feet. The steel work on new bridges over the Rocky and Athabasca Rivers was completed, except for painting. In addition, construction of concrete abutments for a new bridge over Fiddle River was completed. A start was also made on the reconstruction of the road between Maligne Canyon and Medicine Lake.

Flood conditions during May, June and August, which resulted in slides and washouts, necessitated extensive road and bridge repairs in all sections of Banff Park. The bridges over No-See-Um Creek on the Banff-Jasper Highway and over the Spray River near Banff were repaired. A large number of culverts were installed on the Banff-Jasper Highway north of Lake Louise, preparatory to hard surfacing of the road. Reconstruction of the portion of the Banff-Windermere Highway in Banff Park was virtually completed, including the construction of a new bridge over Boom Creek.

In Kootenay Park, work was continued on the Banff-Windermere Highway. Grading of 13 miles of road west from Kootenay Crossing was completed, and 12 miles of this stretch gravelled. The road was also widened to 32 feet. Resurfacing of the section of the highway between Vermilion Crossing and Marble Canyon was undertaken and work also continued on the section east of Radium Hot Springs, where two miles of road was completed after extensive rock excavation.

Satisfactory progress was made in the reconstruction of the Akamina Highway, one of the outstanding tourist drives in Waterton Lakes Park. Grading of five miles of road involving heavy rock excavation was completed. In Yoho Park, progress was made on the construction of a new concrete bridge near the town of Field. The main highway in Elk Island Park was reconstructed to a width of 20 feet and surfaced with gravel. Construction of a new parking area, which eventually will accommodate 2,500 vehicles, was also commenced.

In Prince Albert Park, work was continued on the reconstruction of the main park highway, from the southern boundary to Park Headquarters at Waskesiu. Clearing of the right-of-way to a width of 80 feet was completed to within half a mile of the townsite, and grading and gravelling carried out over 16 miles of road. Abutments were completed for a new bridge over Spruce River; six miles of secondary road were built to connect the Boundary road with the Rabbit-Meridian road; and 10 miles of the latter route were completely reconditioned. In Riding Mountain Park, the Norgate road was re-gravelled throughout its length of 18·5 miles. Re-grading and re-alignment of 6·5 miles of the Dauphin-Clear Lake Highway was completed, preparatory to hard surfacing. Improvements were also made to the North Shore Lake Audy, Whirlpool Lake, and Strathclair roads.

Progress was made on revision of the Cabot Trail in Cape Breton Highlands Park between Ingonish and Neil Harbour. Clearing of 12 miles of right-of-way and some grading were carried out. A new marine drive 7·6 miles in length connecting North Rustico with New London Bay was completed in Prince Edward Island Park. Numerous other roads utilized by park visitors were also improved, including the main road through Point Pelee Park, of which six miles were hard-surfaced.

Trails

Reconstruction of five miles of trail along Spray River between Mile 15, at the end of the fire road, and Mile 20, was undertaken in Banff Park. In Cape Breton Highlands Park a new trail was opened up from a point near Mile 11 on the Cabot Trail to the vicinity of Lake of Islands. In Elk Island Park, approximately 20 miles of trail was graded and made passable for motor vehicles. In Glacier Park, grading and drainage of the 11-mile Glacier-Stoney Creek fire road was completed. In Jasper Park a new trail bridge over the Miette River at Geikie was completed. The trail to a stand of timber at Mile 4 on the Whirlpool River was graded. In Mount Revelstoke Park work on a new trail from Millar Lake to Jade Lake was practically completed.

Communication Systems

Highway revision in a number of the parks necessitated extensive reconstruction or relocation of telephone lines, particularly in Jasper Park, where practically all the pole line between Jasper and the East Gate had to be relocated. At the close of the year approximately 22 miles of this line had been reconstructed. Relocation of telephone lines was also carried out in Kootenay, Prince Albert and Waterton Lakes Parks.

Fourteen and one-half miles of new telephone lines, linking the townsite with Healy Creek Warden's Cabin and Sunshine Lodge were constructed in Banff Park. In Waterton Lakes Park, 11 miles of new tree line were constructed and the Pass Creek and Park Headquarters-Bosphorous lines were rebuilt.

New radio communication equipment was installed in Banff and Cape Breton Highlands Parks.

The following table indicates the existing mileage of roads, trails, and telephone lines within the National Parks, as of March 31, 1949:

Roads

National Parks	Motor	Secondary	Fire	Trails	Telephone Lines
	Miles	Miles	Miles	Miles	Miles
Banff	180·9	.....	103·0	727·75	306·15
Cape Breton Highlands	50·8	5·0	.....	28·26	.....
Elk Island	17·0	10·0	.....	5·0	16·0
Glacier	.....	.....	22·25	95·5	2·0
Jasper	153·5	18·0	59·0	582·5	373·7
Kootenay	61·1	.....	9·5	156·25	60·0
Mount Revelstoke	18·5	.....	.....	82·5	10·75
Point Pelee	7·5	4·0	.....	.....	.....
Prince Albert	67·7	48·0	.....	298·25	129·0
Prince Edward Island	14·5	3·11	.....	.....	.....
Riding Mountain	51·6	52·9	.....	113·0	227·5
Waterton Lakes	47·8	13·5	.....	146·4	76·0
Yoho	45·0	6·5	26·5	204·0	72·5
Total	715·9	161·01	220·25	2,439·41	1,273·6

Buildings

In Banff Park, 162 building permits authorizing building construction by private enterprise were issued. Construction in Banff townsite accounted for over 75 per cent of the total, a new bus depot constituting the major item. A second chalet to accommodate students of the Banff School of Fine Arts was completed. Construction authorized by permit outside Banff townsite included a service station near Lake Louise, and bungalow camp cabins. Building activity undertaken by the National Parks Service in Banff Park included construction of a building in the public parking area at Lake Louise. Foundations were laid for new warden's cabins at "Scotch Camp" and at the Saskatchewan River. Twenty-four buildings were transferred to Banff from the former P.O.W. Camp, at Seebe, and were utilized for various purposes.

In Jasper Park, 53 building permits were issued covering construction of new buildings and alterations and additions to existing buildings by private enterprise. In Jasper townsite the extension to the firehall was virtually completed, and construction of a new information bureau was approximately 80 per cent completed. A Quonset hut, 200′ x 40′ was erected west of the railway yard on an area which is being developed for park workshop purposes. Building construction undertaken by the administration outside the townsite included a new headquarters cabin for the Snaring District, and warden shelter cabins at Meadow Creek, Astoria River, Four Point Camp, at the head of the Brazeau River, and at the base of Arete Mountain, midway between Brazeau River and Isaac Creek. A utility building at the fish hatchery was practically completed. Good progress was made in the construction of a new information bureau at Mile 67, Banff-Jasper Highway, opposite the Athabasca Glacier.

In Prince Albert Park, warehouses were constructed at the golf course and in several warden's districts.

In Prince Edward Island Park, a warden's cottage was completed at Cavendish.

A storekeeper's cabin and a new cookhouse and dining hall were completed in Riding Mountain Park.

In Waterton Lakes Park, work was commenced on immigration staff quarters at Chief Mountain. One of the two staff residences commenced last year was completed, and good progress was made towards completion of the other. Excavation was completed for the hatchery assistant's quarters. Work continued on the construction of a cabin and stable at Crypt Landing.

Townsites

The National Parks Service is responsible for providing normal municipal services in park townsites, including street and sidewalk maintenance, water supply and sewage disposal, garbage collection, fire protection, and public health services, and control of building design. These services are operated on a repayment basis.

An extension of the water service was installed on Cougar Street in Banff. This is a permanent service extended to a chalet operated by the Banff School of Fine Arts. A new concrete dam was constructed on Forty Mile Creek to provide additional storage for the Banff water supply. In Jasper National Park a competition was arranged for the disposal of lots for summer occupancy in a new sub-division at Lake Edith and a number of lots were disposed of by tender. Good progress was made on the construction of a sewer along Pyramid Lake Road; an incinerator was completed and placed in operation.

The extension of electric power and water systems to lots on Ta-Wa-Pit Drive in Riding Mountain Park was practically completed. A new incinerator was constructed in the Town of Field, in Yoho Park, and a disposal ground located west of the town on Ottertail Road.

Tourist Accommodation and Camp-Grounds

New bungalow cabin concessions were granted in Banff, Kootenay, Prince Albert and Riding Mountain National Parks, and good progress in the construction of cabin units was reported. A large building in Point Pelee National Park was leased to a concessionaire for accommodation of park visitors. A reduction in rental for sites occupied by bungalow camps from 5 per cent of the gross profits to 3 per cent was authorized to assist concessionaires in meeting increased expenses.

In Banff Park, additional accommodation provided by private enterprise included a new hotel which was officially opened February 16. Plans were also filed for an addition to an existing hotel which when completed will provide an additional 125 rooms. Construction was virtually completed on all buildings in the Rundle Cabin Camp, leased by the Department to war veterans, and part of the camp was in operation during the summer. Construction completed in the development of a modern camp-ground at Two Jack Lake, included three shelters, service building, trailer park, amphitheatre, fireplace, and caretaker's building. New shelters were practically completed in the camp-grounds at Mount Eisenhower, Johnston Canyon and at the picnic area at Sundance Canyon. A service building was constructed for the extended trailer park in the Tunnel Mountain area and the sewer line was extended to the camp-ground.

In Elk Island Park, electricity was installed in all buildings in the recreation area, and floodlights were erected and put into use at the beach area.

In Jasper Park, a site for a camp-ground was cleared at Pocahontas and the concrete footings poured for a kitchen and washroom. Youth hostel units comprising a central building and two dormitories were erected at Geikie, Athabasca Falls, and Maligne Canyon.

Two new shelters were constructed at Mount Revelstoke and one at Waterton Lakes. In Yoho Park, two new kitchen shelters were constructed at Kicking Horse camp-grounds and one at Takakkaw Falls.

Recreation

A major development for the improvement of recreational opportunities was commenced at Jasper in Jasper National Park. This project, when completed, will include an outdoor swimming pool, wading pool, tennis courts,

bowling green, sports field, skating and curling rinks, and a community hall. At the end of the year good progress had been reported on the construction of the swimming pool and adjoining facilities, and the sports field.

In Banff Park, four new tennis courts were in course of preparation. A new bowling green was opened in Riding Mountain National Park, and another green in Prince Albert Park was completed, except for seeding. New greens were also in various stages of construction in Prince Edward Island, Cape Breton Highlands, and Fundy Parks. One new nine-hole golf course was laid out in Fundy Park and at the end of the season all greens and tees had been completed and seeded, and most of the fairways seeded as well. In Elk Island Park a baseball diamond and basketball court were completed. Additional equipment was purchased for the children's playgrounds in many of the parks and other improvements were effected. An agreement was completed with a well-known golf course architect providing for consultant services in connection with the maintenance and improvement of all golf courses in the National Parks.

For a number of years planned recreation and a nature information service for visitors have been provided in Prince Albert and Riding Mountain Parks. During the summer these services were extended to Banff, Jasper, Yoho, Kootenay, and Waterton Lakes Parks by the appointment of young men with university training who carried out programs of field excursions, lectures and organized sports in these areas.

As an aid to winter sports, the ski jump in Mount Revelstoke National Park was reconstructed to Olympic requirements and improvements were made on the hill below the jump.

A site was provided at Mount Norquay in Banff National Park for the erection by private enterprise of a modern chair-lift. This development was completed late in 1948, and received excellent patronage during the ensuing winter. The operation of the lift during the summer months is planned, and will enable visitors to obtain an excellent view of the Bow Valley and the surrounding mountains.

Conservation Services

Forest Protection

Notwithstanding the unusually high hazard which prevailed in many parts of Canada from spring until autumn, only 22 fires occurred in the National Parks. Most of these were confined to small areas and did little or no damage. The larger fires were reported in the western parks.

The area burned during the year was 4,354 acres, of which 3,985 acres, or 91·6 per cent, was in Riding Mountain Park. Although the area burned was only 142 acres less than in 1947, the damage to merchantable timber and young growth was greatly reduced.

Classified according to causes, smokers were responsible for 27·2 per cent of the fires reported; camp fires and miscellaneous for 18·2 per cent; settlers and lightning for 13·6 per cent; and railways and public works for 4·6 per cent. Lightning, one of the major causes of fires for the last few years, was superseded by smokers, unextinguished camp fires, and miscellaneous causes. Fires originating from settled communities were all confined to Riding Mountain Park.

Fire Losses in the National Parks

Park	Number of Fires		Area Burned Acres		Cost of Suppression	
	1947	1948	1947	1948	1947	1948
					$ cts.	$ cts.
Banff	6	8	4½	330	248 73	139 68
Jasper	3	2	Spot	2¾	8 02	6 56
Glacier	1	0	Spot	0	32 00	.....
Kootenay	0	0	0	0	0 00	.....
Yoho	0	1	0	Spot	0 00	27 80
Mount Revelstoke	0	1	0	¼	0 00	91 17
Waterton Lakes	3	0	Spot	0	33 28	.....
Elk Island	0	0	0	0	0 00	.....
Prince Albert	2	2	161½	30¼	559 67	300 37
Riding Mountain	0	4	0	3,987½	0 00	323 74
St. Lawrence Islands	0	4	0	3½	0 00	69 00
Point Pelee	0	0	0	0	0 00	.....
Georgian Bay	0	0	0	0	0 00	.....
Cape Breton Highlands	3	0	4,330	0	21,136 77	.....
Prince Edward Island	0	0	0	0	0 00	.....
Fundy	.....	0	.....	0	.....	.....
Total	18	22	4,496	4,354¼	22,018 47	958 32

Improvements in Fire Fighting Equipment

Considerable new equipment was purchased during the year for Fundy Park in New Brunswick, as well as additions and replacements for other parks. Among the larger items were 18 portable gasoline pumps, three 250-gallon water tanks mounted on trailers complete with "Jackmite" pumps, 48,500 feet of 1½ inch forestry hose, four tents, five radio transmitter-receivers, two three-ton fire trucks with booster pumps and water tanks, as well as many smaller articles such as hand spray pumps, axes, saws, electric lanterns, Siamese couplings, nozzles, and relief valves.

A new fire lookout was constructed in Kootenay Park. It is an 80-foot steel tower at site K3, near the junction of Kootenay and Vermilion Rivers. This tower permits good coverage of the Kootenay Valley in this area. A preliminary survey was made of prospective sites in Kootenay and Cape Breton Highlands Parks, with a view to undertaking the construction of more lookouts next year.

Fire Weather Forecasting

Weather in the western parks was mostly favourable to forest protection in the mountain areas, except in May and early June, and again in September when short periods of extreme hazard occurred. In the parks in the Prairie Provinces extreme hazard was almost continuous throughout May and again during September and October. High to extreme hazard prevailed in the Ontario parks throughout the late summer and autumn and resulted in several fires in the St. Lawrence Islands Park. In the Maritime Provinces parks, conditions were mostly favourable with one short period of extreme hazard in Cape Breton Highlands Park in mid-July.

All fire danger stations were in operation from the beginning of May until mid-September. The station at Waterton Lakes Park and those in Riding Mountain Park were kept open until the end of October, and those in Cape Breton Highlands Park were in operation until the third week in November. Early in July two new stations were opened in Cape Breton Highlands Park, one at park headquarters near Ingonish Beach, and the other at the warden's headquarters near Pleasant Bay. At the end of the year 18 fire danger stations were in operation in the national parks.

Insect Control

In the autumn a small infestation of mountain-pine bark beetle (*dendroctonus monticolae*) was discovered near the mouth of Amiskwi Valley in Yoho Park. As a result of prompt control measures which included the cutting and burning of 170 infected trees, this infestation was eliminated before it had a chance to spread.

Following a survey which was made in 1947 of an infestation of the false hemlock looper (*nepytia canosaria*), spraying of the infested area, which included about 400 acres in the vicinity of Radium Hot Springs in Kootenay National Park, was carried out by helicopter in July. Investigations carried out by the Division of Entomology after the spraying indicate that it is highly improbable that any further injury from this insect may be expected. However, the area will be kept under observation to guard against any future outbreaks.

Investigations now underway in the national parks include means of controlling the spruce budworm and the lodgepole leaf needle miner in Banff and Kootenay National Parks.

Disposal of Timber

In Riding Mountain Park the cutting of saw-timber and fuelwood under the control of a forest working plan was continued, and considerable quantities of these products were made available for the use of local settlers. There were 1,519 timber permits issued for 2,775,875 feet board measure of saw-timber, 10,910 cords of fuelwood, 52,350 posts, 24,633 linear feet of poles and 8,343 trees. The number of permits issued was considerably less than the previous year, when 2,021 were issued during a corresponding period.

Timber operations were also carried on in Prince Albert Park, where 270,820 feet board measure of spruce was cut for use by the Park Administration. In addition 13 timber permits were issued for 15,000 feet board measure of saw-timber, 177 cords of fuelwood, and 700 fence posts.

With a few minor exceptions, the regulations governing the cutting of timber in national parks were well observed.

Direct Revenue

The net revenue of the National Parks Service of Canada was $630,162.08, as compared with $491,708.61 for the preceding year, an increase of $138,453.47.

National Historic Parks and Sites

The National Parks Service is entrusted with the restoration, preservation, and administration of National Historic Parks and Sites, and the commemoration of the public services of outstanding persons in Canadian history. The Service is advised in this phase of its work by the Historic Sites and Monuments Board of Canada, an honorary body of recognized historians, representing the various provinces of the Dominion.

The personnel of the Board is as follows: Chairman, Dr. J. Clarence Webster, Shediac, New Brunswick; Professor Fred Landon, London, Ontario; Professor D. C. Harvey, Halifax, Nova Scotia; the Honourable E. Fabre-Surveyer, Montreal, Quebec; J. A. Gregory, North Battleford, Saskatchewan; the Reverend Antoine d'Eschambault, Genthon, Manitoba; Professor M. H. Long, Edmonton, Alberta; Professor Walter N. Sage, Vancouver, British Columbia; the Honourable Thane A. Campbell, Charlottetown, Prince Edward Island; Dr. Wm. Kaye Lamb, Dominion Archivist, Ottawa, Ontario; W. D. Cromarty, National Parks Service, Ottawa, Ontario.

The annual meeting of the Board was held in Ottawa, May 17-19, 1948, when a wide variety of matters relating to the historic background of the Dominion were reviewed. Of the many sites that have been considered by the Board to date, 365 have been marked or acquired and 206 others recommended for attention at a later date.

Following is a brief account of development work. In all Historic Parks general maintenance work such as painting, grading, hedge-trimming and routine repairs was carried out.

National Historic Parks

Fort Anne National Historic Park, Nova Scotia

A new drain was constructed in the west moat. A total of 14,547 persons signed the museum register during the year.

Port Royal National Historic Park, Nova Scotia

A cannon was mounted on a suitable platform. Visitors registered at the Park during the year numbered 8,975.

Fortress of Louisbourg National Historic Park, Nova Scotia

A new entrance road was constructed from the park gate to the museum. A new electric lighting system to the park was installed by the Nova Scotia Power Commission. A large anchor, raised from the harbour, was presented to the park by the Department of Transport and placed in a suitable location. A total of 5,012 persons signed the visitors book.

Fort Beausejour National Historic Park, New Brunswick

A new addition to the museum was erected to house the many exhibits received in recent years. This is to be known as the John Clarence Webster Wing as a tribute to the services of Dr. Webster, Honorary Curator of the museum. Visitors registered during the year numbered 19,007.

Fort Chambly National Historic Park, Quebec

A new storage building of stone construction was erected within the fort. During the year 28,319 persons signed the museum register.

Fort Lennox National Historic Park, Quebec

Permission was granted to the Jeunesse Etudiante Catholique organization to use a portion of the park property during the summer as a youth training centre. New toilet facilities were provided for both men and women. Visitors registered in the park during the year numbered 2,830.

Fort Wellington National Historic Park, Ontario

The wall between two rooms on the ground floor of the blockhouse was removed, making one large room which has been converted into a modern museum. New washrooms and storage room were provided. A total of 8,390 persons signed the museum register during the year.

Fort Malden National Historic Park, Ontario

Many articles of historical interest were donated to the museum and a leaflet relating to the park was prepared, copies of which are now available to visitors. During the year 14,004 persons signed the museum register.

Fort Prince of Wales National Historic Park, Manitoba

General supervision was carried out.

National Historic Sites

Lucy Maud Montgomery, O.B.E., Prince Edward Island National Park

A cut-stone monument with tablet was erected at Cavendish in Prince Edward Island National Park to Lucy Maud Montgomery, author of "Anne of Green Gables". The monument was unveiled on September 12, 1948, by the Honourable J. A. Bernard, Lieutenant Governor of Prince Edward Island.

Thomas Beamish Akins and Beamish Murdoch, Halifax, N.S.

Bronze tablets were placed in the main entrance of the Public Archives of Nova Scotia to Thomas Beamish Akins, historian and first Archivist of Nova Scotia, and to Beamish Murdoch, lawyer, legislator, journalist and historian.

James Boyle Uniacke, Halifax, N.S.

A tablet was placed in the Province House to James Boyle Uniacke, Tory leader in the Assembly, 1838-40. He was a member of the coalition government, 1840-43 and leader of the first party administration recognized under responsible government, 1848-54.

The Right Honourable William Stevens Fielding, P.C., Halifax, N.S.

A tablet was placed on the Tramway Building to the Right Honourable William Stevens Fielding, journalist and statesman. He was Premier of Nova Scotia, 1884-96 and Minister of Finance for Canada, 1896-1911 and 1921-25. The tablet was unveiled by the Honourable J. A. D. McCurdy, Lieutenant Governor of Nova Scotia, November 24, 1948.

Ancient Indian Portage near Woodstock, N.B.

A tablet was affixed to the Fort Meductic cairn to mark the portage from Meductic to Eel River which led to the waters of the Penobscot and formed part of the main route of travel between Acadia and New England. During the French regime, military expeditions against the English settlements travelled by way of this portage.

Oliver Goldsmith, St. Andrews, N.B.

A tablet was placed on the Post Office building to Oliver Goldsmith, author of "The Rising Village", a New World contrast to "The Deserted Village". He was the first native-born Canadian poet to achieve more than a local reputation.

William Francis Ganong, Saint John, N.B.

A tablet was placed in the New Brunswick museum to William Francis Ganong, scientist, cartographer, geographer and historian. He was Professor of Botany at Smith College, Northampton, Massachusetts, U.S.A., 1894-1932. The tablet was unveiled by the Honourable D. L. MacLaren, Lieutenant Governor of New Brunswick on August 27, 1948.

Gananoque, Ontario

A cut-stone monument with tablet was erected on the grounds of the High School to commemorate the events which took place there during the war of 1812-14. It was a vulnerable point on the vital line of supply from Lower Canada and was raided on September 21, 1812, when the bridge across the Gananoque River was broken up.

Fairfield on the Thames, near Thamesville, Ont.

A cut-stone monument with tablet was erected adjacent to Highway No. 2 east of Thamesville to mark the site of the village of Fairfield, which was destroyed by invading United States forces following the Battle of the Thames. October 5, 1813. The monument was unveiled on August 15, 1948.

Charles Mair, Lanark, Ont.

A tablet was erected in the Auditorium of the Town Hall to Charles Mair, poet, dramatist, and advocate of western expansion. He was an original member of the Canada First Group.

Sir Richard John Cartwright, P.C., G.C.M.G., Kingston, Ont.

A tablet was placed in the memorial room of the City Hall to Sir Richard John Cartwright, known as "The Rupert of Debate". He was Finance Minister of Canada, 1873-78, and Minister of Trade and Commerce 1896-1911.

Sir Gilbert Parker, Bart., P.C., Belleville, Ont.

A tablet was placed in the Corby Public Library to Sir Gilbert Parker, author of "Pierre and His People" and other novels of Canadian Life. He was a member of the British House of Commons, 1900-18.

George Herbert Locke, Beamsville, Ont.

A tablet was placed on the Municipal Building to George Herbert Locke, educationist and author. He was Chief Librarian of the Toronto Public Library, 1908-37. The tablet was unveiled on October 26, 1948.

North West Mounted Police, near Emerson, Man.

A cut-stone monument with tablet was erected adjacent to the Lord Selkirk Highway in the Parish of St. Agathe to mark the site of Dufferin Barracks where, on July 8, 1874, the newly formed North West Mounted Police consisting of 300 officers and men, having assembled there, left on its assignment to various posts in the Northwest Territories.

Dr. Charles William Gordon, Winnipeg, Man.

A tablet was placed on the University Women's Club building to Dr. Charles William Gordon, "Ralph Connor", author of "The Man from Glengarry", "The Sky Pilot", and other novels of Canadian life. The tablet was unveiled on June 2, 1948.

Chief Crowfoot, Gleichen, Alta.

A cut-stone monument with tablet was erected in the Blackfoot Indian Reserve to Crowfoot, Great Chief of the Blackfoot Confederacy. Under his leadership the Blackfoot ceded to the Crown title to their tribal lands in 1877, began to adopt a sedentary life, and remained loyal during the North West Rebellion of 1885. The monument was unveiled on September 26, 1948.

Dominion Wildlife Service

The Dominion Wildlife Service is responsible for wildlife matters coming within the jurisdiction of the Dominion Government. Its functions include conservation and management of wildlife in the Northwest Territories; advising and co-operating with the National Parks Service regarding fish and wildlife problems in the National Parks of Canada; and administration of the Migratory Birds Convention Act, the Northwest Game Act, and the Fur Export Ordinance. The Dominion Wildlife Service also handles national and international problems relating to Canada's wildlife resources.

In addition to the scientific, administrative and clerical staff in Ottawa, the Service was represented during 1948-49 by six Dominion Wildlife Officers, resident in and responsible for their respective districts. These districts are: the Maritime Provinces; Quebec; Ontario; Manitoba and Saskatchewan; Alberta and the Territories; and British Columbia. Two of these districts (Manitoba and Saskatchewan, and Alberta and the Territories) were established in 1948, and the formerly-existing position of Dominion Wildlife Officer for the Prairie Provinces was abolished.

Officers of the Service permanently engaged in scientific research work in the field include two mammalogists, one at Fort Smith, N.W.T., and one at Aklavik, N.W.T.; and two Dominion Wildlife Management Officers, one in British Columbia and one in the Maritime Provinces. G. F. Boyer, formerly Dominion Wildlife Officer for the Maritime Provinces, was appointed Dominion Wildlife Management Officer for the same district on July 1.

The Dominion Wildlife Service is responsible for the establishment and control of bird sanctuaries under the Migratory Birds Convention Act. A number of these sanctuaries are under the supervision of salaried resident caretakers, employed on a seasonal or an annual basis. Salaried wardens are also employed, where necessary, for protection of trumpeter swans in their breeding and wintering grounds.

Honorary Game Officers are appointed, without salary, to assist the Dominion Wildlife Service in administration of the Migratory Birds Convention Act.

Field Investigations

Biological Surveys

Capt. A. W. F. Banfield, Chief Mammalogist, made four field studies of the status of the barren-ground caribou. Between April 13 and May 23, he made aerial reconnaissance flights over migrating caribou herds in the Mackenzie and Keewatin Districts, N.W.T., and northern Manitoba, flying 12,000 miles and taking 275 aerial photographs. From June 25 to September 7, he investigated the caribou in the eastern Mackenzie District, collecting information on the ground. From November 13 to December 13, he observed the autumn migration of caribou in the vicinity of the Hudson Bay Railway from Ilford to Churchill. From January 20 to February 10, he continued the investigations in northern Saskatchewan covering 2,400 miles in aerial reconnaissance and interviewing Indians, traders and trappers to obtain data on caribou utilization. A. H. Lawrie, A. L. Wilk, F. M. Mowat and D. Peterson were employed as assistants in these investigations.

W. E. Stevens, Mammalogist stationed at Aklavik, N.W.T., conducted biological investigations of the lower Mackenzie River area, including studies of muskrats in the Mackenzie Delta. He was granted leave from December 1, to May 31, to take post-graduate studies at the University of British Columbia.

From July 11 to September 9 J. P. Kelsall was attached to United States Task Force 80 on a supply mission to the Arctic. During this period he carried out wildlife investigations and collected specimens on Baffin, Devon, Cornwallis and Ellesmere Islands. He also visited northwestern Greenland. On September 23, he was appointed Mammalogist for the Eastern Arctic. In October, he investigated fur-bearers and other mammals on Akimiski and other islands within the newly-established James Bay preserve.

The above-mentioned investigations into wildlife conditions in the Northwest Territories are of particular importance because throughout the Territories the aborigines are largely dependent on native mammals for food and clothing, as well as for furs to exchange for trading supplies. The scientific investigations conducted by officers of the Dominion Wildlife Service provide a foundation of factual information on which to base the policy of conservation, management and utilization of wildlife resources in the Northwest Territories for the permanent benefit of the natives.

Wildlife in National Parks

W. A. Fuller, Mammalogist stationed at Fort Smith, N.W.T., investigated the status of muskrat, buffalo, marten, wolf and beaver in Wood Buffalo Park. In August, he supervised the transfer of 50 beaver from Prince Albert National Park to Wood Buffalo Park.

From July 20 to September 10, H. D. Fisher made range studies in connection with the status of elk in Banff National Park; studied winter ranges of game and status of elk, bighorn sheep, goat and predators in Jasper National Park; studied the status of moose in Elk Island National Park; and studied the status of elk in Riding Mountain National Park. From November 29 to December 31, he experimented in wolf control and studied the status of elk, bighorn sheep and mule deer and the slaughter of elk in Jasper National Park. On February 7, Mr. Fisher left the Dominion Wildlife Service to accept a position with the Fisheries Research Board.

During May and June, J. P. Kelsall investigated moose habitat and conditions in the Cape Breton Highlands National Park and made a survey of wildlife conditions in general in the New Brunswick National Park (now Fundy National Park).

Under a contract with the Department, Dr. H. Wesley Curran of the Department of Biology, Queen's University, conducted biological investigations in Point Pelee National Park during January. The aim of the investigations was to determine the status of species with regard to which management problems appeared to be imminent, and in particular to verify allegations of damage by coyotes in the park. There was no evidence of the presence of coyotes in the park at the time of Dr. Curran's visit.

The above-mentioned major investigations reflect the close collaboration of the Dominion Wildlife Service with the National Parks Service in all matters regarding the status of wildlife in the National Parks. The information and recommendations supplied by the Dominion Wildlife Service are of value to the National Parks Service in framing policies whereby wild creatures in the parks may be maintained as nearly as possible in natural conditions.

Fishing and Fisheries Management in National Parks

The limnologist, Dr. V. E. F. Solman, studied fish populations, their food and other environmental factors in 34 lakes and 8 streams in 9 National Parks during the summer. The information secured from these studies and the results of the analysis of creel census data from 11 National Parks are used as guides for effective management of the game fish populations and for the efficient utilization of hatchery products.

In order to study the survival of fish liberated from the hatcheries, more than 100 trout were tagged with numbered metal tags and more than 6,600 were marked by the removal of one fin before release.

In the National Parks Creel Census, 29,542 game fish were reported taken by 7,968 anglers from 117 lakes and 68 streams in 11 National Parks. Since the completion of the cards is voluntary, it is reasonable to assume that a far larger number of fish were actually taken. Reports on the creel census analysis were distributed to more than 1,000 anglers who had indicated interest in the returns.

A licence was issued to McInnes Products Corporation, Limited, of Edmonton, Alberta, to take 250,000 pounds (round weight) of goldeye from Lake Claire, in Wood Buffalo Park, Alberta, on terms prescribed by the Minister. Fishing operations under this licence were carried on from June 5 to June 29. Approximately 119,000 pounds of fish including 76,900 pounds of goldeye, were removed from Lake Claire by the licensee during this period.

A successful shipment of 299 adult lake trout was made from The Pas, Manitoba, to Clear Lake in Riding Mountain Park.

Distributions of trout from hatcheries, as shown in the following table, included more than 20 per cent of yearling and larger fish which have a survival value approximately three times as great as that of fingerling trout.

Numbers of Fingerling and Adult Trout Distributed in National Park Waters During 1948

—	Rainbow Trout		Eastern Brook Trout		Cutthroat Trout	Lake Trout		Total
	Fingerlings	1 to 5 years old	Fingerlings	1 to 2 years old	Fingerlings	Fingerlings	Adults	
Banff	45,000	8,275	23,325	600	33,000	350	.....	110,550
Jasper	31,500	22,670	21,600	2,408	.....	.....	.....	78,178
Kootenay	.....	.....	300	100	.....	.....	.....	400
Riding Mountain	.....	.....	.....	.....	.....	.....	299	299
Waterton Lakes	37,025	28,700	18,149	.....	21,013	.....	.....	104,889
Yoho	3,000	1,000	.....	.....	14,000	.....	.....	18,000
Total	116,525	60,645	63,374	3,108	68,013	350	299	312,314

Large Mammals in Parks

To protect the park ranges from over-grazing, 33 elk in Waterton Lakes National Park, 194 elk in Jasper National Park, 55 elk in Banff National Park and 250 elk in Elk Island National Park were slaughtered. One hundred moose also were slaughtered in Elk Island National Park. The meat and hides were transferred to the Indian Affairs Branch for distribution to needy Indians.

Five hundred and three buffalo were slaughtered in Elk Island National Park. The meat and 450 hides were sold by tender. The remaining 53 hides were reserved for departmental use.

To keep the number of buffalo within the grazing capacity of the range, six buffalo were slaughtered in Banff National Park. Fifty beaver from Prince Albert National Park were transferred by aeroplane to Wood Buffalo National Park.

Ten moose (five males and five females) were transferred from Elk Island National Park to Cape Breton Highlands National Park.

Thirty-one elk and eleven moose were transferred from the National Parks to the Province of Saskatchewan for restocking purposes.

Animals from the National Parks were donated to various zoos as follows: four buffalo—Quebec Zoological Garden, Charlesbourg, P.Q.; two buffalo—Zoological Gardens, London, England; one buffalo and one bear—Wellington Zoo, City of Wellington, New Zealand; and one buffalo and one elk—Chippewa Park Zoo, Fort William, Ont.

Statement of Large Mammals in Fenced Enclosures in National Parks March 31, 1949

Species	Banff Park Paddock	Elk Island Park	Prince Albert Park Paddock	Riding Mountain Park Paddock	Total
Buffalo	10	990	9	41	1,050
Elk	.....	678	.....	151	829
Moose	.....	364	.....	.....	364
Mule Deer	.....	100	.....	.....	100
White-tailed Deer	.....	.....	.....	15	15
Total	10	2,132	9	207	2,358

Migratory Birds

In July and August, Dr. O. H. Hewitt visited wildlife field parties in the Prairie Provinces and investigated problems of crop damage by waterfowl in Saskatchewan and Alberta.

The Dominion Wildlife Officers, J. A. Munro, J. D. Soper, G. M. Stirrett, A. U. Rajotte, G. F. Boyer and D. G. Colls made waterfowl studies in their respective districts. These studies covered migration, nesting and brood-rearing, climate, food, shelter, predation and other conditions affecting waterfowl. J. A. Munro made detailed local studies of waterfowl numbers and reproduction in the Cariboo district and at Duck Lake, B.C. J. D. Soper was in charge of combined parties of technical workers of the Dominion Wildlife Service and the United States Fish and Wildlife Service which made extensive air and ground surveys of waterfowl populations in Saskatchewan. Dr. G. M. Stirrett studied waterfowl in James Bay, including islands in the Bay and the Ontario and Quebec mainland shores, during September and October. G. F. Boyer studied waterfowl in the Midgic Marshes, N.B., and herring gulls alleged to be causing damage at Grand Manan, N.B., and carried out herring gull control operations by egg-spraying at Grand Manan. Mr. Boyer also took charge of organization and administration of the Canadian part of the mid-winter inventory of North American waterfowl in January, in which all Dominion Wildlife Officers assisted.

D. A. Munro was appointed Dominion Wildlife Management Officer in British Columbia on July 1. He made field studies of waterfowl in British Columbia, including participation in the midwinter inventory.

Migratory Birds Convention Act

The Migratory Birds Treaty, signed in Washington, D.C., on August 16, 1916, and made effective in Canada in 1917 by Act of Parliament, was designed for the better protection of the many valuable birds that migrate between Canada and the United States. In this conservation measure the Dominion and the provinces co-operate. Regulations in accordance with the statute are agreed upon before being adopted by Dominion order in council.

Responsibility for enforcement of the provisions of the Migratory Birds Convention Act and Regulations thereunder was transferred to the Royal Canadian Mounted Police in 1932.

As of March 31, 1949 there were 74 bird sanctuaries in Canada, set aside under the Migratory Birds Convention Act, with an approximate area of 1,800 square miles. Seven of these—Britannia Bay Bird Sanctuary in Ontario; Saskatoon Lake Bird Sanctuary in Alberta; Val Marie Reservoir, Upper Rousay Lake, Duncairn Reservoir, Scent Grass Lake and Murray Lake Bird Sanctuaries in Saskatchewan—were established during the period under review.

On November 26, 1948, the following five bird sanctuaries which had been transferred to the Province of Saskatchewan in 1930, and which through climatic change had become unsuitable for the purpose for which they were established, were cancelled in accordance with the terms of the Natural Resources Transfer Agreement: Bigstick Lake, Cabri Lake, Chaplin Lake, Crane Lake and Whitebear Lake Bird Sanctuaries.

Field administration of the Migratory Birds Convention Act was continued under supervision of the Dominion Wildlife Officers.

In areas where special protection is required, such as breeding grounds of eider ducks and other sea-birds on the north shore of the Gulf of St. Lawrence and haunts of the rare trumpeter swan in Alberta and British Columbia, special salaried game officers are employed by the Dominion Wildlife Service. Thirty-two such salaried officers were employed in 1948, nineteen of these being employed on an annual basis and thirteen on a seasonal basis.

Honorary Game Officers are appointed without salary to assist in enforcement of the Migratory Birds Convention Act and Regulations and to further the cause of wildlife conservation. There are 320 active holders of this appointment. In addition, all members of the Royal Canadian Mounted Police and all Game and Fishery Officers of the Provinces of Alberta, British Columbia, Manitoba, New Brunswick, Ontario, Quebec and Saskatchewan held in 1948 the appointment of Game Officer *ex officio* under the Migratory Birds Convention Act.

The waterfowl situation in Canada was, on the whole, better in 1948 than in 1947. In British Columbia an unusually heavy snowfall and a late spring produced abnormal flood conditions, which destroyed many early nests. All species of ducks in this province decreased in numbers from the previous year. In the Prairie Provinces the spring was late, with water levels unusually high. Rains in June and July prevented a repetition of the summer droughts of 1946 and 1947, except in southwestern and west central Saskatchewan. Breeding populations in all three provinces were higher than in 1947, and production was improved, particularly in Alberta and Manitoba. In Eastern Canada an over all increase in the number of breeding ducks was observed, with moderate decreases in some species. There was evidence that the 1948 hatch in the northern breeding grounds of the Atlantic Flyway had been successful.

Minor changes in seasons and bag limits were made in the Regulations under the Migratory Birds Convention Act. Close co-operation was maintained with provincial governments, game conservation societies, and other organizations interested in migratory bird conservation.

Bird Banding

In order to conserve and manage wild birds by statute and otherwise, a broad and firm foundation of facts about many aspects of bird life is necessary. The only practical and satisfactory way in which much of the required information can be obtained is by means of systematic bird banding. Official bands bear a distinctive number, whereby the birds marked with them may be identified as individuals when they are later recaptured, killed or found dead. The official bands used in Canada and the United States bear the inscription "Notify Fish and Wildlife Service, Washington, D.C." On the basis of records of bands recovered, not only can the movements of individual birds be studied, but several aspects of the activities of a species or group of species may be investigated.

In North America, bird banding is conducted co-operatively by the Dominion Wildlife Service and the Fish and Wildlife Service of the United States Department of the Interior. Much of the banding throughout Canada and the United States is done by voluntary workers of recognised ornithological ability, who serve without remuneration, furnish their own equipment (except bands), and pay for incidental expenses. The number of these authorized bird-banders in Canada is approximately 200. Permits to band birds in Canada are issued, and official Canadian bird-banding records are kept by the Dominion Wildlife Service.

Official bird banding in Canada has been under Dominion Government administration since 1923. The records of the Dominion Wildlife Service provide the following figures for birds banded and bands recovered:

	Calendar Year 1948	*Total up to December 31, 1948*
Birds banded	31,731	553,318
Bands recovered	3,602	38,039

Current ornithological and conservation literature contains many papers concerning bird-banding investigations and tabulations of the results. These demonstrate clearly the practical usefulness of bird-banding as an aid to applied ornithology. Many fields of possible bird-banding investigations have yet to be explored fully, and much of the information already accumulated has not yet been put to maximum use. Particular attention is being given in Canada at present to the banding of wild ducks and geese.

Miscellaneous

Under the provisions of the Migratory Bird Regulations 1,414 permits and licences were issued: scientific collecting, 413; eiderdown collecting, 2; destruction of birds injuring agricultural or fishing interests, 204; collecting herring gull eggs, 90; taking migratory birds for propagation, 8; possessing migratory birds for propagation, 621; and taxidermists' licences, 76.

Printed items distributed were: Migratory Birds Convention Act, 9,172; abstracts of Migratory Bird Regulations, 18,119; posters, 55,115; and educational and instructive pamphlets, 19,222.

Wildlife in the Northwest Territories

Fur Production

Fur production on the whole held steady. As expected, the take of muskrat increased sharply, from 336,662 in 1947 to 395,992 in 1948. Beaver and squirrel also showed notable increases. In the case of beaver this was in part due to an extension, on March 1, 1948, of the area in which beaver hunting is allowed. Declines were shown in the harvest of all kinds of fox furs, and although the decrease was slight in the number of white fox pelts exported, adverse reports from the regions where white fox is the staple fur, indicate that a marked decline may be anticipated next year.

The take of marten was disappointing in the area in which an open season was declared. A survey conducted during the summer of 1948 revealed a serious decline in the marten population in the region south of Great Slave Lake. Accordingly a complete close season for marten was established for the region.

There has been no change since March 1, 1948 in the area in which beaver may be taken, but reports from some points indicate an increase in the numbers of these animals.

Investigations by the two biologists stationed at Fort Smith and Aklavik have added much valuable scientific information which is being put to use in the regulation of fur production. Their work has been greatly aided by the wardens of the Forest and Wildlife Organization and other field officers.

Registration of Trapping Areas

Draft regulations for the registration of trapping areas in Mackenzie District were prepared for consideration by the Northwest Territories Council. It is intended that registration will become effective in 1949.

In the very important muskrat-hunting region of the delta of the Mackenzie River the hunters have already co-operated with the Forest and Wildlife Organization in a modified form of registration. During the open season hunters were encouraged to hunt only in the areas they expect to register later. Many boundary adjustments have been made and disputes settled. Much practical experience in the administration of trapping areas and related subjects has thus been gained.

Northwest Game Regulations

Amendments to the Northwest Game Regulations were: Order in Council P.C. 3078 dated July 8, 1948, established the James Bay Native Game Preserve. This area includes the waters of James Bay and all islands therein, except the Twin Islands Game Sanctuary; Order in Council P.C. 5247 dated November 17, 1948, established a close season for marten in the region to the south of Great Slave Lake.

Game Ordinance

By an amendment to the Northwest Territories Act assented to May 14, 1948, the Commissioner of the Northwest Territories in Council was given authority to make an ordinance for "the preservation of game in the Territories." The Game Ordinance of the Northwest Territories, to be implemented under the power thus conferred, was prepared during the year. It includes most of the provisions of the Northwest Game Act and Regulations, which it will supersede, and also contains a number of important new features, including registration of trapping areas. The policy of conserving wildlife resources for the use and benefit of the native inhabitants will be continued.

The Ordinance was given first reading at a meeting of the Council on March 24, 1949.

Fur Export Ordinance

The Fur Export Ordinance of the Northwest Territories was amended by reducing the rate of tax charged on each pelt as follows: beaver, $2.00 to $1.50; coyote and wolf, 50¢ to 25¢; fisher, lynx and marten, $3.00 to $1.50; black, cross and silver fox, $1.50 to 75¢; blue fox, $2.00 to 75¢; red fox 50¢ to 25¢; otter, $1.50 to $1.00; and skunk, 15¢ to 10¢. The rate of tax charged on each mink pelt was increased from $1.00 to $1.25. The effective date of the change in rates was March 1, 1949.

General

Eight fur farms were licensed to operate in the Northwest Territories during the fiscal year.

There were 15 prosecutions for infraction of the game laws and convictions were secured in all cases.

Comparative figures of the number of big game animals and birds taken

	Year ended June 30	
	1948	*1947*
BIG GAME		
Caribou	15,617	12,006
Deer	11	82
Moose	306	427
Sheep	15	8
GAME BIRDS		
Ducks	10,408	11,527
Geese	838	859
Grouse	1,128	630
Partridge	792	2,374
Prairie chicken	4,073	769
Ptarmigan	5,094	6,188

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Comparative statement of licences and permits issued and revenue derived under the Northwest Game Act and the Fur Export Ordinance

	Licences Year ended June 30 1948	1947
Hunting and trapping—		
Resident	379	465
Game bird	145	49
Trading and Trafficking—		
Resident	98	105
Non-resident, British	6	4
Non-resident, non-British	1	1

	Permits Year ended June 30 1948	1947
To establish trading posts in N.W.T.	9	11
To take animals for propagation purposes	1	1
To take scientific specimens	14	8
To take (10) beaver	581	493
To take (5) caribou	38	—
To take (5) marten	1,059	—
To Indians to hunt and trap in Wood Buffalo Park	217	260

Revenue under Northwest Game Act and Fur Export Ordinance

	Year ended March 31 1949	1948
Hunting licences	$ 797.88	$ 860.00
Trading licences	924.82	1,845.00
Bird licences	359.00	402.00
Fur farm licences	19.00	21.00
Trading post permits	8.00	9.00
Caribou hunting permits	90.00	55.00
Sale of furs	359.00	4,212.88
Fur Export Tax	95,632.83	141,423.38
Fines and forfeitures	479.64	164.79
Sale of buffalo hides	1320.00	825.00
Total	$ 99,991.07	$149,818.05

Lands Division

The Lands Division deals with Crown-owned lands, mining, and timber in the Northwest Territories and the Yukon. It also administers certain lands in the provinces including ordnance and admiralty lands not required for purposes of national defence; public lands; lands reserved to Canada under the Transfer of Natural Resources, together with the records pertaining thereto; unpatented Dominion lands on the security of which loans under the Soldier Settlement Act were made; and certain mineral rights reserved by virtue of Section 57 of the Soldier Settlement Act. The Division maintains a Central Office of Record of Federal-owned or controlled lands; a record of seed grain, fodder and relief advances made by the Dominion to settlers in the western provinces and in conjunction with the provinces deals with applications for the adjustment or apportionment of accounts; and issues Letters Patent.

Northwest Territories

Mining

The value of mineral production in the Northwest Territories was $4,298,089 which exceeded the production of 1942, formerly the peak year, by $498,398. The Yellowknife River Valley area remained the centre of mining activity and prospecting for base metals and radio-active ores was carried out in widely scattered areas from Rankin Inlet on Hudson Bay to Detention Harbour on the Arctic Coast.

Several factors which will tend to further development of the mineral resources in the Northwest Territories influenced this record production. The Snare River Storage and Power Project was officially opened on October 4. The 386-mile Grimshaw-Hay River all-weather road and the 155-mile Hay River-Yellowknife winter road were completed and will greatly expedite the delivery of essential supplies and equipment.

Record prices stimulated the search for base metals and several notable discoveries were made.

An outstanding discovery was made during the period under review in the Indian Mountain Lake area in the Yellowknife Mining District, where a zinc-lead find on the "B.B." and the "Voy" groups of claims by James McAvoy and Associates precipitated a staking rush late in the season. Approximately 2,700 claims were staked from October to March 31. Hollinger Consolidated took an option on the "B.B." group for an 80 per cent interest, and completed 6,000 feet of diamond drilling to test the extension of the main zone.

In the 500 square-mile Pine Point area on the south shore of Great Slave Lake, reserved under Order in Council P.C. 1004, the Consolidated Mining and Smelting Company of Canada, Limited completed 9,100 feet of diamond drilling. On Feb. 1, 1949, a second Order in Council, P.C. 453, was passed authorizing the withdrawal from disposal under the Quartz Mining Regulations of four parcels totalling 1,267 square miles in area adjoining the first reservation on its three land sides. The Order in Council together with a map was published in a leading weekly mining paper and tenders called for. Tenders were received from Consolidated Mining and Smelting Company of Canada, Limited and American Metal Company of Canada, Limited. Parcel "A", consisting of an area of 265 square miles west of the original Pine Point Concession, was awarded to the American Metal Company of Canada, Limited, and Parcel "D", consisting of 320 square miles east of the original concession, to the Consolidated Mining and Smelting Company of Canada, Limited.

In the Thubun Lake area, approximately 500 claims were staked around the high grade lead find on the "MWK" group of claims.

The mineral belt from Selwyn Lake to Rankin Inlet in the Keewatin District was actively prospected by the Don Cameron Exploration Company, Hudson Bay Exploration, and Cyril Knight Associates.

The increase in mining development made necessary the appointment of a mining engineer to assist the resident mining inspector who acted in a technical mining advisory capacity to the mining recorder on all claim work. The extension in underground development required practically the entire attention of the mining inspector to be focused on maintenance of the provisions of the Mining Safety Ordinance. Correlation of field inspections and organization of work was supervised by the Chief Mining Inspector who made two seasonal trips to all active mining areas.

Revenue

The revenue derived from fees collected during the fiscal year under the various mining regulations applicable to the Territories was $329,304.46 as compared to $339,541.79 for the previous year. This revenue was derived as

follows: Quartz Mining—general fees, $50,930.60; mining leases, $10,161.30; surface leases, $279.96; royalties, $4,925.00; and miner's licences and renewals, $41,879.65: Petroleum and Natural Gas—leases, $1,839.23; surface leases, $1,295.41; permits (refund)—$250.00; and petroleum and natural gas royalties and Government share in production of the "Proven Field", $217,651.65: Coal—leases, $204.51; permits, $15.00; and royalties, $5.50; Gravel—permits, $351.00: and Quarrying—leases, $15.65.

Producing Mines

The Con-Rycon Mines remained the largest gold producers in the Northwest Territories and milled at the rate of approximately 300 tons per day. The roasting plant was re-opened and treated approximately 18 tons of concentrates per day. Production for 1948 was 55,252 fine ounces. Drifting in the Campbell Shear Zone continued on the 2,350-foot level and also diamond drilling at 100-foot intervals to test the Zone.

Giant Yellowknife Mine, which began milling on May 13, stepped up production since the installation of roasting and cyanidation plants, and in March produced 8,115·28 ounces of bullion from 6,730 tons of ore and 1,077·8 tons of flotation concentrates treated. The milling rate for March was 250 tons daily which was expected to be stepped up to 500 tons by midsummer. The Snare River project supplied one-quarter of its power to Giant Yellowknife.

Negus Mine increased its daily mill tonnage to 179·5 tons from the 65 tons of the previous year. Production for 1948 was 23,240 fines ounces of gold. When the Campbell Shear Zone was intersected at the 11th and 13th levels stoping operations in this zone supplied the entire mine production.

Thompson-Lundmark, situated at Thompson Lake 35 miles northeast of Yellowknife, produced 14,696 fine ounces of gold in 1948. Production at this mine was expected to cease unless the summer's work proved up more ore. Reclassification under the Emergency Gold Mining Assistance Act enabled the company to undertake new exploration of its property, and a program was started that included a minimum of 10,000 feet of diamond drilling.

Value of Mineral Production

The value of mineral production in the Northwest Territories for the past four years and the total production to the end of 1948 is indicated by the following figures supplied by the Dominion Bureau of Statistics.

—	1945*	1946*	1947*	1948*	Total Production to end 1948*
Gold	333,218	860,685	2,188,095	3,556,875	20,949,274
Silver	956	5,113	32,655	19,036	894,327**
Lead	.....	.....	.....	.....	490
Copper	.....	.....	.....	.....	24,102
Tungsten	.....	.....	.....	.....	37,674
Crude Petroleum	136,303	173,392	500,238	676,574	2,995,308
Natural Gas	335	335	.....	15,000	18,595
	470,812	1,039,525	2,720,988	4,267,485	24,919,770

* Exclusive of the production of "Radioactive" ores.
** Accumulative total since 1932. Production of Silver prior to 1932 included in returns for the Yukon.

During the fiscal year, 2,136 miner's licences and renewals were sold, 5,290 quartz grants were issued, and 2,616 assignments of mineral claims were recorded. In addition, 80 leases comprising 4,868·04 acres were issued under the Quartz Mining Regulations.

Coal, Petroleum and Natural Gas, and Dredging

Three annual permits were issued under the Domestic Coal Mining Regulations, and one coal lease issued under the Coal Mining Regulations was cancelled.

In the petroleum and natural gas field one permit comprising 64,000 acres in the neighbourhood of Fort Providence was in good standing.

Six leases comprising 3,279·23 acres and the "Proven Field" at Norman Wells comprising 7,939 acres were still in good standing. Production of 302,436 barrels of oil from the "Proven Field" during the year raised total production since April, 1942, to 2,514,208 barrels. Royalties and the Government's share of proceeds from the sale of the oil amounted to $217,651.65, making a total revenue of $488,599.01 since the Proven Field Agreement came into force in May 1945.

Two dredging leases were cancelled for non-payment of rental.

Lands and Timber

Lands

During the year an Agent of Dominion Lands and a Crown Timber Agent was appointed for that portion of the Northwest Territories north of the Arctic Circle. The headquarters of the new agency are at Aklavik.

Land Sales

Thirty-nine sales were effected during the year, the following settlement lots being sold: Aklavik, 12; Hay River, 18; Taltson River, 4; Fort Smith, 3; Arctic Red River, 2; Rat River, 1; and Resolution, 1.

Leases and Permits to Occupy

There are now in effect 775 leases and permits to occupy. Of these 602 are for land in Yellowknife Settlement, and the remainder for land at various points throughout the Northwest Territories. The types of leases and permits are: residential and business purposes, 723; agricultural, 13; fur farm, 12; grazing, 3; shipyard, 3; and waterfront, 21.

The leases in force in Yellowknife Settlement include thirty-two under which veterans have made application for assistance in accordance with the provisions of the Veterans' Land Act.

To assist other lessees in obtaining mortgages from the Central Mortgage and Housing Corporation and other similar agencies, it was decided to increase the effective tenure from the five year terms previously granted, to periods up to twenty-one years.

Leases for lands in other parts of the Northwest Territories are issued generally for terms of ten years. In all cases leases contain an option of renewal for a term equal to that for which the lease was originally granted. Permits to occupy unsurveyed lands are issued subject to cancellation upon the serving of a stipulated notice.

Authority was obtained to enable veterans owning lands to transfer such lands to the Crown in order that application could be made for grants under the Veterans' Land Act.

During the year, forty-one assignments affecting leases were registered in the Department; two hay permits were issued during the year under which 35 tons of hay were cut.

Timber

One hundred and forty-five timber permits, exclusive of those granted in connection with commercial timber berths, were issued authorizing the cutting of 10,000 feet board measure of lumber, 173,456 feet of timber, and 4,944 cords of fuel wood. Of these permits fifty-five were issued free of dues to charitable, educational and religious institutions and to Government Departments.

Seventeen commercial timber berth permits were granted, under which 2,413,835 feet board measure of lumber was manufactured, and 6,265 lineal feet of timber and 3,293 cords of fuel wood cut.

One timber seizure was made.

Revenue

The total revenue received from Lands, Timber, Grazing and Hay was $40,115.49.

Yukon Territory

Mining

Mining activity was stimulated during 1948 by world demand and high prices for strategically and industrially required metals. Gold production was maintained at a steady rate and 60,589 fine ounces was produced, an increase of 12,844 ounces over 1947 production. The Dawson Mining District, where Yukon Consolidated Gold Corporation Ltd. dredged 47,649 ounces, was the largest producer. Increased activity was apparent in the base metal field, particularly in the vicinity of Mayo, where United Keno Hill Mines, Ltd., established a record production of lead for this mine, while its increased silver production had a marked influence on Canada's total production of that metal.

Prospecting and development continued to increase in both placer and quartz mining, although placer operations were suspended during the severe winter months. There were 2,609 grants and renewal grants, and 72 prospecting leases covering 174 miles, issued under the Placer Mining Act. Under the Quartz Mining Act, 410 grants were issued and 781 grants renewed.

Revenue

The revenue collected from mining in the Territory was $85,204, made up as follows: quartz mining fees $14,697.85; quartz surface lease $26.50; placer mining fees, $33,255; placer mining royalty (export tax on gold), $28,549.85; hydraulic mining leases, $2,390; survey fees $5,600; and coal leases and royalties $684.80.

Gold Royalty

The amount collected on placer gold up to March 31, 1949, was $5,424,-349.36, of which $28,549.85 was collected during the fiscal year.

Hydraulic Mining Locations

Four hydraulic mining locations were still held under the old regulations, which were withdrawn by Order in Council dated February 2, 1904. These leases comprised sixteen linear miles. Rentals amounting to $227,808 have been collected to date from this source, of which $2,390 was collected during the fiscal year.

Coal Mining and Dredging Leases

Four coal mining leases were in good standing. One lease was cancelled for non-payment of rental. No new dredging leases were issued.

Quartz Mining and Surface Leases

There were 147 quartz mining leases in force, of which two were renewals for the second period of 21 years. One annual surface lease was issued under the Quartz Mining Act.

Placer Mining

Yukon Consolidated Gold Corporation, Limited, in the Dawson District, remained the principal producer of placer gold in the Territory and operated seven dredges and one dragline. The company employed an average of 350 men, and recovered 47,649 fine ounces of gold and 10,022 fine ounces of

silver from 7,146,660 cubic yards of gravel treated. Yukon Explorations, Limited, operated one dredge in the Sixty-mile area. Other companies which produced gold from placer operations in the Dawson District were Reno Gold Mines and Miller Creek Placers. In the Whitehorse District, Kluane Dredging, Burwash Mining Company and Bates Creek Placers were active, and in the Mayo District production was from individual recovery.

Quartz Mining

Interest in quartz mining was stimulated by amendments made in 1948 to the Yukon Quartz Mining Act, which allowed for the grouping of 16 claims at any time before filing assessment work and granting of credit for excess work up to an amount sufficient to qualify for certificates of improvements. As the result of a decision to enforce Section 78 of the Act, a Dominion Lands surveyor was sent into the Territory last summer to survey mining claims. This policy will enable claim sheets to be issued in the Yukon similar to those in use in the Northwest Territories. Under both the Quartz and Placer Mining Acts, amendments made in 1948 required the affixing of metal tags to posts of mineral claims.

Mayo Mining District remained the centre of lode mining in the Territory. United Keno Hill Mines, Limited, was the largest producer of base metals, mining silver-lead ores containing some zinc at Galena Hill. The bulk of its production was from the Hector claim at the Calumet-Hector mine. The company owned or held under option approximately 170 claims in the vicinity of Keno Hill. Production was 1,904,562 ounces of silver, 5,064,848 pounds of lead and 493,469 pounds of zinc.

The Silver Basin Yukon Mines, Limited, a new company in the Mayo District, held options on property in the Silver Basin area of Keno Hill and on the Rocket-Tyee group on Crystal Slope of Galena Hill. Satisfactory results were reported from both properties. Other companies operating in the Mayo District were the East Bay Mining Company with property on McKay Hill, and Yukon Galena Hill Mines Limited, operating on the Keno and Rio claims at Keno Hill.

Mining Inspection Service

A mining inspection service was inaugurated under provisions of the Yukon Mine Safety Ordinance. The Chief Mining Inspector inspected important properties, including the Calumet-Hector Mines on Galena Hill, located approximately 35 miles east of Mayo Landing.

Yukon Territory
Value of Mineral Production

—	1945	1946	1947	1948	Total Production to end 1948
Gold(1)	1,221,258	1,664,260	1,671,075	2,121,490	217,605,669
Silver(2)	11,824	26,124	267,877	1,288,964	22,577,899
Lead	5,976	3,520	156,556	829,599	5,375,759
Copper	.....	.....	.....	.....	2,711,695
Coal	.....	.....	.....	25,857	829,049
Tungsten	.....	.....	.....	.....	18,315
Antimony	.....	.....	.....	.....	173
Totals	1,239,058	1,693,904	2,095,508	4,265,910	249,118,559

(1) Includes gold from the refining of silver, lead, and copper ores and a small amount from lode gold mining in addition to that from placer mining.
(2) Includes silver from the refining of placer gold as well as that from lode mines.

Assay Office

Nine hundred and two samples of rock were received and 1,525 assays or quantitative analyses were made. In addition, qualitative analyses and chemical tests were made of various rocks and minerals of which no record was kept. The assays made were: gold and silver, 902; lead, 502; copper, 68; zinc, 50; molybdenum, 2; antimony, 1. The lead, copper and zinc figures showed a considerable increase over the previous year.

Lands and Timber

Land Sales

Twenty-six lands sales were effected during the year, involving fifty-eight lots in Dawson, twelve in Whitehorse and five in Selkirk.

To enable veterans owning lands to apply for assistance under the Veterans' Land Act, authority was obtained to enable such veterans to transfer their land to the Crown for a nominal consideration. Under this arrangement an agreement of sale is then issued in favour of the veteran for a period of ten years. At the expiration of this period the land reverts to the veteran for the same nominal consideration.

Twenty such agreements of sale are in effect in the Yukon Territory.

Leases and Permits to Occupy

There are now in effect 69 leases and permits to occupy. The types of leases are: agricultural, 8; grazing, 1; residential and business, 37; and waterfront, 23. Leases are generally granted for a period of ten years, and contain a renewal option for a further like term. Three homestead entries were granted, bringing the total number in effect in Yukon Territory to 25; two hay permits were issued, under which 35 tons of hay were cut.

Timber

One hundred and seventy-nine timber permits, exclusive of those granted in connection with commercial timber berths were issued, authorizing the cutting of 4,428 lineal feet of timber and 24,566 cords of fuel wood.

Nineteen commercial timber berth permits were issued under which 389,164 feet board measure of lumber was manufactured and 44,390 lineal feet of timber and 1,505 cords of fuel wood cut.

Fourteen licence timber berths were in effect. There were no timber seizures.

Revenue

The total revenue derived from lands, land titles and timber during the year was $26,937.13.

Ordnance, Admiralty and Public Lands

Detailed appraisals and reports were prepared by competent appraisers on individual parcels of land under the control of the Department. In the past, little effort was made to sell these lands as prices were not satisfactory. It has been the practice to secure a six per cent return by leasing. However, the appraisals and reports indicated the possibility of disposal to some lessees at present favourable values and, where there is no future Government requirement, lands are being disposed of by sale.

Appraisals, investigations and reports on 603 lots were completed and surveys were made of 31 parcels in Quebec and nine in Ontario. These latter were necessary in order to bring plans up to date for registration purposes and, in certain cases, to recover lost or destroyed monuments.

Approximately 1,000 acres of land, formerly controlled by the Department of National Defence and no longer required for military purposes, have been transferred to the administration.

One hundred and fifty-three subdivided lots and 40 parcels were sold for $96,433.28. Thirty-four agreements for sale, covering a two to four-year period and totalling $21,695.01, were completed. Down payments on these amounted to $6,737.53, with an anticipated annual revenue, until completion of agreements, of $5,351.57. Seventy-five leases with a total yearly rental of $3,088.28 were negotiated.

Many of the lands which this Division is called upon to administer are old properties originally held in the right of the Crown by the Imperial Government and in some cases title is clouded. Other properties were acquired prior to accurate surveys and boundaries are vague. The task of searching these and other complicated titles is, in many cases, difficult. The lands records are constantly being revised as up-to-date reports, surveys and appraisals are made.

Public Lands

Public lands originally acquired by other Government departments for specific purposes and no longer required, are transferred to this Department for administration or disposal. Three parcels of land, comprising 725 acres in British Columbia, Ontario and Quebec, were received during the year. Nine areas, totalling 210 acres, were sold and 23 investigations were carried out. The net revenue from Public Lands was $9,957.00.

Dominion Lands Records

Experienced departmental officers continued to examine and segregate files for disposal in conformity with procedures approved by the Public Records Committee and the Treasury Board. Files relating to patented and unpatented homesteads and other phases of land settlement in Manitoba were transferred to the Department of Mines and Natural Resources, Winnipeg, and those of no value were destroyed. Files containing material of historic value are set aside for transfer to the Public Archives of Canada. Dominion lands files relating to land settlement in Saskatchewan, Alberta and the Railway Belt of Peace River Block in British Columbia will be dealt with after completion of segregation and shipment of the Manitoba files.

Completed during the year were: 2,709 cabinet drawers of files examined; 209 cartons, containing approximately 34,150 files, weighing 12,000 pounds, shipped to Manitoba; approximately 102,600 files destroyed which represents about 5,100 pounds of paper salvaged; and 898 standard steel file cabinet drawers emptied, of which 846 have been put to use in other sections of the Department.

The space thus acquired provided office accommodation in the Vimy Building for a section of the Lands Division removed from the Norlite Building.

A land index to the thousands of letter-press copies of patents issued for Dominion lands over a period of 47 years is being prepared. Approximately 59,700 patents were indexed according to land description.

Timber and Grazing Within the Provinces

Timber

In British Columbia there are eight licensed timber berths comprising an area of 42·85 square miles within the boundaries of National Parks. Licences, in duplicate, were issued for each berth and the revenue amounted to $988.94.

Operations were continued on Timber Permit Berth No. 5111 in the Dominion Government Coal Block near Hosmer, B.C., and the revenue collected amounted to $38.59.

The timber cutting privilege, granted in 1942 on Ordinance Reserve No. 1 and Naval Reserve A on St. Joseph Island in Lake Huron, Ontario, was brought to a close on August 31. The revenue collected for the portion of the fiscal year during which the timber cutting privilege was in force amounted to $84.29, representing the dues on 19,778 feet board measure of lumber and 245 spruce railway ties.

Grazing

On animal quarantine reserves in southern Saskatchewan eight grazing permits were issued covering 11,040 acres. Sworn returns by the permittees indicated that for the grazing season there were 394 cattle and 92 horses maintained on the lands. The revenue collected was $291.40.

Soldier Settlement

Charged Lands

These are lands against which charges are registered for advances made under the Soldier Settlement Act and are reserved to the Dominion under natural resources transfer agreements with the western provinces. Crown grants are issued to settlers who have paid their indebtedness to the Soldier Settlement Board and have completed their duties in accordance with the terms of the Dominion Lands Act. If the indebtedness is not paid or if the indebtedness has been paid and the settler requests this action to be taken, patent may be issued in the name of the Director of Soldier Settlement of Canada. There are some 7,200 acres of these lands remaining. During the year the soldier loans were released from 20 parcels.

Mineral Rights

The question of the disposal of mineral rights in certain lands held by the Soldier Settlement Board became very active during the year.

Several hundred applications for such petroleum and natural gas rights, particularly in Alberta, were received and, as the Department of Veterans' Affairs hold the Soldier Settlement Records, these applications are being considered by that Department to ascertain whether or not there is a soldier interest. In many cases a search of title indicates that the rights are not controlled by the Federal Government and the applicants are referred elsewhere.

The underrights in approximately 6,000 acres, more than 5,000 of which are in the Province of Alberta, were cleared to this Department for administration because there is no soldier interest. The task of clearing additional properties, searching titles and dealing with applications continued. These petroleum and natural gas rights will be leased.

Central Office of Record

The Central Office of Record was set up under the provisions of Order in Council P.C. 258, dated February 12, 1934, which provided that the Dominion Lands Administration (now the Lands Division) shall be the central office of record of lands owned or controlled by the Dominion, and that the various Departments shall furnish this Department with the information needed to maintain a record of the properties. More than 8,000 parcels have been listed and it is intended to request those departments that have not yet furnished the necessary particulars to do so as soon as convenient.

Seed Grain, Relief and Fodder Indebtedness

The indebtedness referred to under this section is represented by the accounts still outstanding for advances of seed grain, fodder for animals, and relief made to settlers in Western Canada from 1876 to 1926. The advances are secured by liens on the settler's property and bear interest varying from 5 per cent to 7 per cent. The advances are of two kinds; those in the sole right of the Federal Government and those in which the Federal and Provincial Governments shared equally.

By 1927 many properties in Western Canada were encumbered by seed liens and arrears of taxes far in excess of the depreciated value of the land. Collection of the outstanding accounts was at a standstill and the land idle. To ameliorate this condition the Federal Government passed an Act, assented to April 14, 1927, which established Seed Grain Adjustment Boards to investigate the indebtedness and where warranted to recommend an adjustment. During the fiscal year 1948-49 the Seed Grain Adjustment Boards made 484 recommendations to Council and as a result $175,815.50 was written off and 2,167 liens removed. There were also 71 advances paid in full and the liens discharged. Cash payments in the net amount of $76,472.85 were made by the property owners.

In addition to the settlements effected through the Seed Grain Branch, approximately 1,600 requests were received from provincial governments and Western Debt Adjustment Boards for statements of outstanding indebtedness. As a result of the land grants being made by the provinces, 36 certificates of indebtedness were issued registering 112 liens against title as security for advances that had been made on unpatented land.

The following summary shows the financial operations for the year ended March 31, 1949:

—	Principal	Interest	Total
	$ cts.	$ cts.	$ cts.
Debits			
Balance outstanding March 31, 1948	2,183,152 29	3,494,174 34	5,677,326 63
Accrued interest April 1, 1948, to March 31, 1949	.....	125,179 44	125,179 44
Total debits	2,183,152 29	3,619,353 78	5,802,506 07
Credits			
Net revenue, April 1, 1948, to March 31, 1949	49,353 05	27,119 80	76,472 85
Amount written off as loss by Orders in Council—(Sec. 1 Chap. 51, 17 George V.)	44,666 06	131,149 44	175,815 50
Total credits	94,019 11	158,269 24	252,288 35
Amount outstanding March 31, 1949	2,089,133 18	3,461,084 54	5,550,217 72

Province of Manitoba

—	Principal	Interest	Total
	$ cts.	$ cts.	$ cts.
Debits			
Amount outstanding March 31, 1948	9,441 28	16,195 14	25,636 42
Accrued interest April 1, 1948, to March 31, 1949	.....	509 02	509 02
Total debits	9,441 28	16,704 16	26,145 44
Credits			
Net revenue April 1, 1948, to March 31, 1949	210 53	156 95	367 48
Amount written off as loss by Orders-in-Council	46 30	201 88	248 18
	256 83	358 83	615 66
Amount outstanding March 31, 1948	9,184 45	16,345 33	25,529 78

Province of Saskatchewan

—	Principal	Interest	Total
	$ cts.	$ cts.	$ cts.
Debits			
Amount outstanding March 31, 1948	1,455,938 21	2,296,491 01	3,752,429 22
Accrued interest April 1, 1948, to March 31, 1949	.....	84,143 11	84,143 11
Total debits	1,455,938 21	2,380,634 12	3,836,572 33
Credits			
Net revenue April 1, 1948, to March 31, 1949	35,007 60	23,560 09	58,567 69
Amount written off as loss by Orders in Council	8,798 28	48,712 67	57,510 95
Total credits	43,805 88	72,272 76	116,078 64
Amount outstanding March 31, 1949	1,412,132 33	2,308,361 36	3,720,493 69

Province of Alberta

—	Principal	Interest	Total
	$ cts.	$ cts.	$ cts.
Debits			
Amount outstanding March 31, 1948	717,747 80	1,181,446 94	1,899,194 74
Accrued interest April 1, 1948 to March 31, 1949	.....	40,526 06	40,526 06
Total debits	717,747 80	1,221,973 00	1,939,720 80
Credits			
Net revenue—April 1, 1948, to March 31, 1949	14,134 92	3,402 76	17,537 68
Amount written off as loss by Orders in Council	35,821 48	82,234 89	118,056 37
Total credits	49,956 40	85,637 65	135,594 05
Amount outstanding March 31, 1949	667,791 40	1,136,335 35	1,804,126 75

Province of British Columbia

	$ cts.	$ cts.	$ cts.
Amount outstanding March 31, 1949	25 00	42 50	67 50

Letters Patent

There were 57 Letters Patent issued covering a total of 2,390 acres, divided according to provinces as follows:

	Patents	Acres
Alberta	10	1,006
Manitoba	3	192
Saskatchewan	5	678
Northwest Territories	33	344
Yukon Territory	6	170
	57	2,390

The various kinds of grants are dealt with in the following table:

	*Homesteads		*Soldier Grants		†Special Grants		*Sales		*Pre-Sales	
	Patents	Acres	Patents	Acres	Patents	Acres	Patents	Acres	Patents	Acres
Alberta	5	691	2	260	1	14	2	41	.....	.....
Manitoba	2	160	.....	.....	.....	.....	1	32	.....	.....
Saskatchewan	.....	.....	2	273	2	269	.....	.....	1	136
Northwest Territories	.....	.....	.....	.....	.....	.....	33	344	.....	.....
Yukon Territory	1	160	.....	.....	.....	.....	5	10	.....	.....
Total	8	1,011	4	533	3	283	41	427	1	136

*Under this heading are included lands entered for by returned soldiers affected by loans from the Director of Soldier Settlement of Canada, said loans having been repaid in full. Patents were issued direct to the settlers.

†Under this heading are included lands entered for by returned soldiers affected by loans from the Director of Soldier Settlement of Canada, which lands were patented to the said Director at the request of the entrants or pursuant to Salvage Proceedings under the Soldier Settlement Act.

There were 263 Certified Copies of Letters Patent prepared during the fiscal year for which the Department received $695.

Engineering and Construction Division

The Engineering and Construction Division functions as a general engineering and architectural service for the Department and acts in a consulting capacity as required.

Increased construction programs were carried out for the National Parks Service, in the Yukon and Northwest Territories, and for the Indian Affairs Branch. The major projects included the construction of new roads, as well as the improving, paving, and preparation of roads for hard surfacing; the construction of steel and reinforced concrete bridges, and the replacement of many wooden spans with steel trusses; and the construction of reservoirs, dams, swimming pools, and buildings. This work was largely done by contractors under supervision of the Engineering and Construction Division.

There is still difficulty in recruiting suitably qualified engineers and architects to design and supervise these projects. In consequence the services of architects in private practice were secured to prepare or assist in preparing plans, on some of the major projects, and later as contracts were awarded these architects supervised the work.

Work for National Parks Service

Banff Park

In Banff and Kootenay National Parks seven miles of the Banff-Windermere Highway, commencing at Castle was completed. The grading of a further 13·2 miles was completed from Mile 38·5, and 12 miles of this was gravelled. Further work was started at the Radium Hot Springs end of the highway and carried northeasterly through heavy rock cuts to widen and improve this portion of the highway. A 30′ span bridge was erected over Boom Creek and plans were prepared for a new bridge on Haffner Creek crossing. Plans for road revisions at Marble Canyon were also prepared.

On the main highway through Banff Park improvement in drainage was effected in the vicinity of Banff townsite by the installation of approximately 6,600′ of culvert pipe and plans and estimates were prepared for improvement work required on Eldon Hill. At the townsite of Banff a contract was awarded for the construction of concrete water clarification tanks and a pumping station to ensure a pure water supply to the Banff hatchery. This is necessitated by the proposed chlorination of the water system at Banff. The existing rock crib dam on Forty Mile Creek was replaced with a modern concrete structure to provide additional storage for the Banff water supply.

Plans and designs for two sections of the proposed storm sewer system in Banff townsite were completed. Preliminary sketches for a new fire station at Banff were also completed. Plans were examined and approved for extensions to the Mount Royal Hotel and for the new Cascade Hotel at Banff.

Estimates were prepared for replacement of the existing bridge over the Spray River. Investigations were made and reports prepared on bridges throughout Banff Park, on the main highway, and on a number of minor bridges on that part of the Banff-Jasper Highway in Banff Park.

Kootenay Park

Plans and specifications were completed and preliminary construction work done for the proposed bath-house and swimming pool at Radium Hot Springs. Plans and specifications were also prepared for the water and hydro-electric power supply to Government buildings and residences at this point.

Yoho Park

A contract was awarded for the abutments and piers, and grading and gravelling of the approach road to the Kicking Horse River bridge at Field. A contract was also awarded for erection of the superstructure of this bridge. Improvement of the highway entering Field from the east was investigated. Surveys were also made for proposed water and sewer systems for the town of Field.

Jasper Park

Construction and preparation for hard surfacing of approximately 32 miles of the Jasper-Edmonton Highway from Jasper to the east boundary of the park was undertaken. The greater part of this work was completed by the close of the construction season. Preliminary work was completed on 18·28 miles and gravelling was completed on 14·45 miles of the Banff-Jasper Highway in Jasper Park.

Improvement of the road from Jasper through the Maligne Canyon to Medicine Lake, a distance of approximately 13·68 miles, was begun. Work started in September and was closed down early in December.

The replacement with steel highway trusses of four wooden spans of the Athabasca River bridge and of two wooden spans of the Rocky River bridge, was completed with the exception of laying the asphalt deck, installing the guard rails, and painting. A contract was let for the construction of a substructure for the new Fiddle River bridge and this work was completed; tenders were called for the supplying and erection of two steel highway trusses.

Plans were prepared for the erection of a new water reservoir on Cabin Creek in Jasper townsite and for the extension of the water mains in the townsite.

Recreational facilities and buildings on which construction was commenced in Jasper townsite included a swimming pool and bath-house, tennis courts, bowling greens, the removal of the curling rink to a new site, the erection of an information building, the construction of an addition to the fire hall, and minor improvements such as the construction of fences and sidewalks. Construction of camp-ground buildings at Miette Hot Springs was also undertaken.

Waterton Lakes Park

A contract was awarded for the reconstruction and preparation for hard surfacing of 9·81 miles of the Akamina Highway which runs from Waterton townsite through the park to the British Columbia boundary. The work closed down in November. Fine grading was completed over half the distance and gravelling over 1½ miles. The condition of the bridges in the park was reported on and plans were laid for major repairs to be made to the Crooked Creek Bridge on the Cardston entrance road.

Elk Island Park

A considerable amount of fencing and building of a fire guard was completed and a design prepared for a proposed meat dressing and storage building. Construction was postponed because of the unexpectedly high cost shown by tenders received.

Prince Albert Park

The improvement and preparation for hard surfacing of 28·7 miles of the Waskesiu Highway was commenced. Preliminary clearing was done on the whole distance, and rough and fine grading and gravelling was completed for about 16 miles. Orders were placed for the erection of a deck girder bridge of 50′ span over the Spruce River, and other smaller bridges were replaced. Detailed plans were prepared in connection with repairs and reconstruction of the breakwater at Waskesiu.

Riding Mountain Park

A start was made on the reconstruction and preparation for hard surfacing of a section of No. 10 Highway commencing from the north boundary of Riding Mountain Park, through the park to the east boundary. When operations closed in November, gravelling had been completed on approximately 6½ miles.

Point Pelee Park

The six-mile main entrance road to the park was revised and paved. There has been difficulty with erosion on the east side of the Point and a report on this condition was prepared.

Fundy Park

Proposed improvements and reconstruction of certain sections of No. 14 Highway running through the park were investigated.

Cape Breton Highlands Park

A contract was awarded for the reconstruction and preparation for hard surfacing of sections of the Cabot Trail, including bridges and trestles. When the work closed down in November approximately 12 miles of highway had been cleared and considerable rough and fine grading and gravelling done. Reinforced concrete deck girder bridges were erected over Warren Brook and Neil Brook, and steel was on the ground for bridges at Black Brook, Still Brook and Halfway Brook. A reinforced concrete deck girder bridge was also erected over the North Aspy Brook and the steel was placed for a girder bridge over the west branch of the North Aspy River. Construction of R.C.M.P. quarters was completed.

Prince Edward Island Park

A new road between Rustico Harbour and New London Bay, a distance of 7·6 miles was completed.

Historic Sites

New roads, totalling approximately 3,400 feet, were built at the Fortress of Louisbourg Historic Site, and a major addition to the museum at Fort Beausejour was made. The construction of approximately two miles of gravel road from the highway to Fort St. Joseph Historic Site was also completed.

Work for Northwest Territories and Yukon Services

The Mackenzie Highway, known formerly as the Grimshaw-Great Slave Lake Highway, was completed from the north boundary of Alberta to Hay River settlement, a distance of 81 miles. An interesting factor in the construction of this road was the encountering of permafrost areas about which little prior information was available. Data obtained from the work on this project will be of great value in future road construction activities under similar conditions.

During construction operations on the Dominion-Provincial section of this highway in Alberta, a distance of 234 miles, an engineer of the Engineering and Construction Division was resident until July to examine and report upon all phases of operations. The operations in Alberta were engineered and supervised by the Department of Public Works of the Province of Alberta. The Federal Government has paid $1,375,000 toward the cost of this road during the past three-year period.

In Yukon Territory, a 46-mile section of the Mayo-Minto road was under construction. Work was completed on 26 miles when operations closed in October, and preliminary work had been done on a further four miles. Other reconnaissances were carried out in connection with future roads in the Whitehorse area.

In the Northwest Territories, a winter truck road was completed from Hay River to Yellowknife. A fisheries road of nearly three miles was completed from the new Fisheries Settlement to Hay River, as well as a further road to the waterfront. Electrical requirements at Fort Resolution and Fort Smith and a proposal for a summer water supply at Aklavik were investigated. A recon-

naissance survey was carried out for a summer road between Fort Smith and the Mackenzie Highway, and a similar survey was made of a proposed route for a winter truck road from the vicinity of Yellowknife to Discovery-Yellowknife Mines.

Plans were prepared for a two-room school with teachers' and R.C.M.P. quarters at Coppermine, and for a four-classroom day school combined with principal's quarters at Fort Smith.

Work for Indian Affairs Branch

In the Northwest Territories and Yukon plans were prepared for a residential school at Hay Lakes, and a four-classroom school, with principal's residence and power house, was built at Hay River. Plans were also prepared for two-room schools at Aklavik and Rocher River. Reports in connection with installation of electrical generating and distributing systems and with water supply at various points were made.

In British Columbia various projects were undertaken in the Okanagan, Nicola, Williams Lake, Kamloops, Kootenay, New Westminster, Vancouver, Kwawkewlth, Bella Coola, Skeena, Babine, Lytton, Stuart Lake, West Coast, and Cowichan agencies. This work covered examination of buildings for the purpose of undertaking renovation of water, heating, and electrical services; investigation and repair of damage done by the flood condition which occurred early in the spring; surveys of irrigation and drainage systems; and planning of wharves at two reserves in the Skeena Agency. After investigation and report to the Indian Affairs Branch much of the work reported on was completed.

The projects undertaken in Alberta largely related to schools. Investigations and reports were made of the following agencies: Stony-Sarcee, Athabaska, Hobbema, Saddle Lake, Blood, Blackfoot, and Lesser Slave Lake. Major repairs were necessary to a large number of the schools at these points and following investigation and report the necessary rehabilitation work was carried out either by, or under the direction of, the Division.

Similarly in Saskatchewan and Manitoba the major work had to do with school premises. In Saskatchewan, work was carried out in the Pelly, Touchwood, Battleford, Onion Lake, Carlton, Crooked Lake and Qu'Appelle Agencies. In Manitoba the agencies visited included Fisher River, Portage La Prairie, Griswald, Norway House, Manitowapah, and the residential schools at Brandon and Elkhorn.

In Ontario, work was carried out at Christian Island, Kenora, Gordon River, Manitowaning, Fort William, Alnwick, Cape Breton, Sioux Lookout, Sault Ste. Marie, James Bay, Six Nations, and Golden Lake Agencies. Sewage, water and electrical services, and erosion on the McIntyre Bay and Gull River reserves in the Fort William Agency, were investigated. Some 3·5 miles of gravel road was completed by contract under supervision in the vicinity of the McIntosh Residential School at the Sioux Lookout Agency.

In Quebec a new twelve-room day school and boiler house for the Caughnawaga Agency was completed under contract. Investigations relative to heating and water supplies were carried out at Maniwaki, St. Regis, and Gaspé Agencies, and further work was done in connection with the plans for the proposed residential school at Seven Islands.

In the Maritime Provinces minor inspection work was completed in connection with the agent's residence at Kingsclear in the West District Agency of New Brunswick, the residential school at Shubenacadie in Nova Scotia, and in connection with agency buildings on Lennox Island in Prince Edward Island.

General work for the Indian Affairs Branch included electrical and mechanical drawings for a standard Indian agent's residence; similar drawings with bills of material for standard one-room and two-room day schools with teachers' quarters.

Dominion-Provincial Projects and Miscellaneous

Supervision was maintained over two major highway projects being built in co-operation with provincial governments. The first was the 36-mile Snow Lake mining road from Wekusko on the Hudson Bay Railway to Howe Sound Mine, to which the Dominion contributed 50 per cent of approved expenditures. The second was the Cranberry Portage-Cuprus Mines section of The Pas-Flin Flon road which will extend for approximately 27·7 miles. The maximum Dominion contribution is 50 per cent of a total estimated cost of $838,000.

The Division was called upon for a variety of other information, including plans and specifications covering five dam projects in the vicinity of Lac La Hache, B.C., for the Dominion Wildlife Service. The tenders on these projects were examined and recommendations made. A report was made on the comparative value of insulating materials for refrigerators; specifications were prepared for the mixing and laying of asphalt pavement; a paint specification was prepared relative to the painting of structural steel in connection with bridge construction; and instructions were prepared on the care and maintenance of heating systems in connection with the Indian Affairs schools. In connection with the Trans-Canada Highway conference held in Ottawa a considerable amount of data and maps, including routes and mileages, was prepared.

Indian Affairs Branch

D. M. MacKay, Director

Good progress was made during the year towards the ultimate goal of affording the Canadian Indian opportunities equal to those of fellow Canadians of the white race. In this progress there were indications that the Indians themselves were cognizant of the objective and on many reserves the development of community interest set an encouraging pace.

Economically, the lot of the Indian followed the pattern of other Canadians. With the exception of some northern areas, where the scarcity of game and the drop in fur prices brought hardship and the necessity of relief measures, the Indian shared fully in the national prosperity. Wages were high, crops abundant, and there was but little unemployment.

In respect to the fur harvest, in which the Indian has played so historic a part, the Department was alive to the necessity of pushing further planned conservation and production measures. With the co-operation of the Provincial Government concerned, much was accomplished in the way of registering trap lines for Indians. The program of beaver and muskrat preserves began to pay dividends to the Indian hunters. Fortunately, the drop in fur prices was largely confined to long-haired furs and good returns were still available for beaver and muskrat pelts.

In the matter of education, the most vital factor in planning, steady progress was made despite high building costs and the scarcity of teachers. Twenty-four new day schools were constructed and extra classrooms added to other schools. A start was made towards increasing the number of Indian children attending white schools through the co-operation of Provincial departments of education and by arrangement with local school boards. There was an increase in the number of Indian children attending secondary schools, and the percentage of fully qualified teachers in the Indian service increased sharply.

Field reports indicate that as educational facilities were increased a demand for improved housing followed. Increased personal income made it possible for many Indians to build new homes or improve their present ones. This trend is noticeable on many reserves. Many new homes were completed by Indian war veterans as a result of grants. Departmental assistance to Indians for the building or improvement of homes amounted to $651,000.

A small monetary monthly allowance to aged Indians was a new welfare project put in operation. This allowance is in addition to rations, housing or special medical diet. Three thousand eight hundred and fifty old people were in receipt of this allowance.

The administration was reorganized in a number of regions, particularly in Manitoba and the Northwest Territories.

Of particular importance was the meeting of the Indian Commissioner for British Columbia and the seven Regional Supervisors at an eight-day conference in Ottawa. This conference of senior field officers was the first in twelve years and will prove of value in planning long range policy as well as productive of immediate measures designed to facilitate the work of the administration both at headquarters and in the field.

Population

The Department takes a quinquennial census of the Indians under its administration. The last Departmental census was taken in 1944, and, accordingly, another is being taken in the fiscal year 1949-50. The records of the Branch indicate that there has been a slow but steady increase in the population during the present century.

The following table shows the number of Indians by provinces according to the 1944 census:—

Province	*Population*
Alberta	12,441
British Columbia	25,515
Manitoba	15,933
New Brunswick	2,047
Northwest Territories	3,816
Nova Scotia	2,364
Ontario	32,421
Prince Edward Island	266
Quebec	15,194
Saskatchewan	14,158
Yukon Territory	1,531
Total	125,686

A more detailed statement giving statistics of the Indian population under the headings of religion, age, and sex in the various provinces will be found in Table 1.

Progress During the Year

British Columbia

The Indians of British Columbia continued to improve their lot with increased numbers taking advantage of year round employment in industry. Opportunities in seasonal work in fish canneries, in hop fields, and in fruit picking in British Columbia and the State of Washington remained on a high level at slightly increased wages. Financial returns to those Indians employed on farms in haying and harvesting work were less than average because of unusual flood conditions which greatly reduced crops. Indians employed in lumbering experienced an average year and those engaged in trapping received slightly less revenue for their catch through reduced fur market prices.

Agricultural operations on reserves in the interior of the Province indicated an increase in the acreage planted and in the numbers of livestock. More than 18,000 beef cattle are owned by Indian farmers and ranchers. Market prices for cattle were higher than in previous years.

Returns from salmon fishing in the Skeena and Nass River areas compared favourably with those of the previous year although complete returns to Indian fishermen who are engaged in this branch of the fishing industry along the entire Coast were somewhat less due to an earlier closing date being established for the season. Returns from herring, halibut and dog fish (liver) fishing increased, and a successful season was experienced in clam digging in the central and southern coastal areas of the province. An increase was also noted in the number of fishing boats purchased.

There was a marked increase in the building of new homes and in repairs and improvements made to existing dwellings. The Department assisted a number of families on various reserves by supplying the material necessary to effect repairs and improvements.

A difficult year was experienced on reserves throughout the Fraser Valley and other areas where floods caused considerable loss. In some cases this necessitated almost complete re-establishment and, in others, major repairs to homes and the reseeding of land. In this work the greatest co-operation was received both from the Indian families involved and from the various authorities delegated to re-establish the flood victims.

The Indians of British Columbia were included for benefits under the British Columbia Hospital Insurance Act which became effective on January 1, 1949. This Act provides hospitalization and other special services where hospital care is required for all cases other than those of a chronic nature.

Alberta

Eden Valley, a beautiful tract of land situated near the E. P. Ranch in southern Alberta, was acquired as a small reserve for a group of Stony Indians who have resided in the area for many years.

Favourable moisture conditions, following a prolonged winter and late spring, brought good returns of grain from Hobbema south. Lack of moisture in the area from Edmonton north brought low yields and many failures. It was generally a good year, with 732,060 bushels of grain threshed on all reserves.

Although the severe winter caused some losses, excellent pasturage in the southern half of the Province enabled Indians to market their beef cattle in good condition. High prevailing prices brought livestock sales of more than a half million dollars. Thousands of tons of wild hay were sold, and an ample supply retained for winter feeding.

Many farming Indians acquired their own machinery and others purchased equipment and foundation livestock through loans from Band Funds.

Income from hunting and trapping, the basic industries in the north, was lower because of the smaller catch and a price recession. Fortunately, the muskrat catch was fairly good, and caribou were plentiful. Several superintendents were appointed class "B" fur dealers, in an attempt to increase returns from the sale of pelts. Though no appreciable progress was made in the propagation of beaver, some transplanting was done. Income from commercial fishing was not large, but there was sufficient fish for domestic consumption.

Timber sales for the year increased. Indians operated saw-mills on several reserves, with considerable lumber and logs going into home construction.

The oil industry continued to contribute income to Band Funds from permits and leases. Six wells were drilled on reserves, but no oil was obtained in commercial quantities.

Many Indians continued to find lucrative employment away from their reserves, particularly on a power project at Spray Lakes, and on intensive farming projects in the southern part of the province and the adjacent northern United States.

Three new day schools were opened, and construction started on several more.

Saskatchewan

On the majority of the reserves the year was a good one. Revenue fluctuated in localities according to crop production; although long-haired fur dropped in price a considerable income was obtained from beaver and muskrat pelts marketed through the Fur Marketing Board.

Crops in the Battleford and Carlton Agencies were seriously affected due to the long dry season. On the other hand the Pelly Agency, which, in Indian population, is the smallest in the Province, had a surprisingly high yield of 158,444 bushels of grain.

Income from hunting, trapping and fishing, while subject to a drop in prices, was still a major source of revenue. The Indians of the Province realized $467,802 from it. Carlton Agency alone had an income of $283,736 from this source.

There was a slight reduction in the number of cattle. Those Agencies where cattle production had previously been most satisfactory suffered greatly from drought. Cattle had to be reduced in numbers according to feed available.

Housing conditions improved in many localities. One hundred and fourteen new homes were erected and 268 Indian houses were repaired and improved.

The health of the Indians seemed to improve throughout the year with no serious epidemics reported. Efforts to reduce the T.B. incidence by B.C.G. vaccine and other medical facilities were continued.

Manitoba

General conditions throughout the Province showed improvement with an even economic balance in favour of the Indians, who showed a sincere desire to improve their living conditions.

Livestock prices reached a new high and, as a result, an additional effort was made to increase and improve breeding stock.

Farming methods also improved with the utilization of power machinery and more modern methods. The harvest yield was most satisfactory; wheat averaged thirty bushels and oats sixty bushels to the acre. Community gardens were planned and land broken for this purpose.

Trapping income was down over the previous year because of the drop in fur prices. However, considerable income was realized from this source and, in conjunction with the Provincial Government, organized trap-lines were laid out with a view to increased fur catches.

A number of Indians successfully engaged in commercial fishing despite the drop in price of low grade fish during the latter part of the year.

Six new schools were erected giving an increased accommodation of seven classrooms. Attendance increased with the provision of this more suitable accommodation.

A major administrative reorganization took place involving the closing of two agencies which were incorporated within the Portage la Prairie Agency.

Two new agencies were opened, one at Dauphin, Manitoba, and one at Ilford on the Hudson Bay railroad. The reorganization was designed to provide four agencies in the southern part of the province where agriculture predominates and three in the northern region where trapping, lumbering and fishing are the principal occupations.

Ontario

In the southern part of the Province production was maintained at a high level. Wages were high, crops were good and satisfactory prices were obtained for farm produce. Many Indians were employed steadily in industry or as farm labourers.

The Indian farmers of the Tyendinaga, Six Nations, and Caradoc Reserves enjoyed a prosperous year. Holstein cattle owners on the Tyendinaga Reserve improved their herds and a number of Indian war veterans were becoming established Holstein breeders.

Continuous employment and high wages were reflected in improved housing conditions as Indian home owners carried out needed repairs and improvements and built new houses. Additional numbers of Indian veterans were re-established under the Veterans' Land Act.

Four new schools were completed providing an additional eleven classrooms for southern Ontario reserves, and it was noted that the number of Indian boys and girls attending secondary schools in this region increased.

In the northern and northwestern regions, where about 20,000 Indians reside, trapping was the main income source, augmented by summer employment mostly in the lumber industry.

Returns from trapping were only fair. Catches were about average but prices, which had been exceptionally high, returned to a more normal level. Employment in lumbering was good until, towards the end of the season, a drop in the demand for pulpwood was experienced. Those employed as guides benefited from an increase in the tourist traffic.

A region-wide program for the transplanting of live beaver was carried out with considerable success. The project tended to improve some existing traplines as well as providing for additional lines in the future.

Housing conditions in most agencies improved during the year. A saw-mill was put in operation at Moose Factory to provide lumber for a long-term improvement project in that agency.

Educational facilities were increased with the construction of a number of day schools. Those at West Bay and Murray Hill in the Manitoulin Agency and at Fort William in the Port Arthur Agency are considered excellent units and are already filled to capacity.

Quebec

A decline in the price of fur and opportunities of profitable employment elsewhere caused many Indians in the northern region to seek and obtain employment in industry. At Bersimis, Seven Islands, Maniwaki, Weymontaching, Obedjiwan and Restigouche, the number of Indians engaged in the pulpwood industry increased sharply.

At Bersimis, a commercial fishing project was reorganized and 25,000 lbs. of salmon caught and sold. The profit was distributed on a percentage basis to those participating. Although this was the only commercial fishing project under way, the majority of the reserves engaged in fishing for home consumption.

Special attention was paid to improving educational facilities. At Caughnawaga, a twelve-classroom fireproof school was almost completed. At St. Regis, a two-room day school with residence was built. In Abitibi, log schools were constructed at Waswanipi, Mistassini and Obedjiwan. These will be used as seasonal schools.

The construction of homes reached a new high. One hundred and twenty homes were built and many others renovated and repaired. Homes were built from welfare appropriations at Pointe Bleue, Restigouche, Oka, and Maniwaki, and others built from Band Funds at Bersimis and Maniwaki.

Farming methods on some reserves showed a marked improvement, with the utilization of modern methods and machinery. This was particularly noticeable at St. Regis, Pointe Bleue, Maniwaki, Oka and Timiskaming.

In those agencies where health measures had been applied there was improvement in the general health of the Indians. The B.C.G. treatment for T.B. was continued throughout the year, and in the Abitibi Agency, where the need was greatest, a systematic check was maintained. A number of nurses were appointed and small nursing stations established at key points. A modern nursing station was also completed at St. Regis. Steps were taken to facilitate dental treatment. A dentist, stationed at Caughnawaga, was provided with a mobile unit which will serve all reserves.

New Brunswick

Employment was at a fair level throughout the year. The largest income was derived from potato picking in the State of Maine. On the Tobique, Woodstock and Kingsclear Reserves barrel and basket making was successfully engaged in, and other Indians secured employment in the cities and from farmers. Indians from the eastern region were employed on bush work in the winter and in fishing during the summer.

A number of V.L.A. grants were approved, with new homes for veterans resulting. Non-veteran Indians were also assisted in the construction of new homes and in the improvement of existing ones. About twenty new homes were completed.

Roads on the reserves were improved, and, with the co-operation of the Provincial Government, the maintenance of winter roads was extended.

A number of administrative changes were made with a view to greater efficiency, and ultimate benefit to the Indians concerned. The superintendent of New Brunswick North was appointed on a full time basis. He and his staff were provided with suitable accommodation at Perth. On the Kingsclear Reserve, a resident nurse was provided with living quarters, an office, and a motor vehicle.

In general, a trend towards improvement in health and living conditions was noticeable.

Nova Scotia

Considerable progress was made in carrying forward the centralization program at Shubenacadie and Eskasoni where 30 new homes were completed and occupied by Indian families moving from more remote areas. New land was also cleared and broken in preparation for additional moves and to provide gardens and pasture.

The Indians did not fare so well in industrial employment, with the result that the building program has been beneficial from the employment aspect.

Indian veterans continued to take advantage of the Veterans' Land Act. In each case the veteran's home was built of lumber cut and milled on the reserve and the work done entirely by Indian labour. By these means the Indian veteran was able to acquire a new home at a cost of approximately $2,300.

School attendance increased with Family Allowance benefits contributing noticeably to the general well-being of the children. At Eskasoni a new school-bus was provided to bring in 100 children from a radius of three miles. Stores operated by Indians at Shubenacadie and Eskasoni under the supervision of Agency administration continued to do well throughout the year. These stores, which are financed through a revolving fund loan, have an annual business gross of approximately $60,000 each. Profits accruing will be used on community projects.

The health of the Indians continued to improve and the use of X-rays and hospitalization further tightened the control of T.B. Inoculations are reducing the incidence of such contagious diseases as whooping-cough and diphtheria.

Prince Edward Island

The Agency construction program contributed largely to the year's activity. Surplus airport buildings were dismantled at Mount Pleasant Airport and shipped to Lennox Island. A modern four-room day school, an agency office and warehouse, an agent's residence and a small nursing station were included in the buildings resulting from this reconstruction project.

The school, staffed by the Sisters of Ste. Martha, opened in September.

A store, badly needed by the Indians, was opened through the provisions of the Revolving Fund, and, staffed by Indian clerks, is already doing a commendable amount of business with a fair margin of profit.

The Lennox Island Indians had a ready market for their potato basket production which is their most profitable source of employment. The culture of oysters was continued with a view to eventual larger returns.

Through the co-operation of the Provincial Government a number of short courses were given on the reserve covering such subjects as agriculture, nutrition, fishing and community improvements. These courses were well attended with satisfactory results.

Yukon Territory

A program of fur conservation and control by use of registered trap-lines was carried out. This project is of inestimable value for the welfare of many Indians in the Yukon whose main income is derived from hunting and trapping.

Economic conditions generally were not good. Long-period work was scarce largely because of the closing down of the coal mine at Carmacks and saw-mills at Mayo during the winter season. Big game hunters, who provide seasonal employment for many Indians, were fewer than usual.

The encouragement of vegetable growing among the Indian population continued with success. Carcross residential school produced 6,000 pounds of potatoes, 1,500 pounds of carrots and 1,500 pounds of turnips besides other vegetables. This experimental work in vegetable growing was assisted by the operation of a greenhouse at Mayo Indian village, where community spirit was at a high level. The building of a new school, cultivation of gardens, and competitive sports assisted this trend.

Community enterprise was noticeable during the year. Service clubs and others assisted by donating prizes for academic achievement in the schools and for competition in sports such as hockey and lacrosse. Of particular interest was the growth of the Indian Boy Scout Troops at Whitehorse and Carcross. These troops, in accordance with the requirements of the movement, purchased their own uniforms with money earned individually by doing chores, and took part in a successful combined annual camp.

Northwest Territories

A general reorganization of Indian Affairs administration in the Territories was commenced. This involved a re-allocation of regional offices and new personnel. It is visualized that this reorganization when completed will materially assist the Indians scattered over great areas in the northwest, by providing closer supervision and greater educational and health facilities.

The year itself was a bad one for the Indians of the three agencies. Game was scarce and the decline of fur prices seriously affected their livelihood with resulting increase in relief costs. Added to this burden was the increased cost of white man's food, to which the Indian has to resort when his natural food supply diminishes.

In the Fort Norman Agency much ground work was done in compiling statistics on births and deaths and other information requisite for Family Allowances and the old age allowance. During treaty trips to Fort McPherson, Arctic Red River, Good Hope and Fort Franklin, Indians of these areas were X-rayed as part of a concerted program to combat T.B.

The scarcity of fish in some lakes in the Fort Simpson area, and the fact that the caribou passed through the area to seek better grazing grounds, made the year a difficult one for Indians in that region.

Reserves and Trusts Service

Reserves Division

Land Sales and Leases

Eighty-eight parcels of Indian lands were sold, and of this number, 68 were cash sales realizing $51,190.30, and 20 were time sales totalling $22,663.67.

Receipts from cash sales and collections on land sale contracts amounted to $415,990.09, and of this total $392,360.61 represented principal payments, and $23,629.48, interest payments.

Seventy-seven purchasers of Indian lands on a time sale basis completed their payments, and five sale contracts were cancelled. Letters Patent were issued in favour of 153 purchasers of Indian lands.

Rent collected under leases and permits covering Indian lands and reserve lands totalled $322,204.08, and at the end of the year 2,124 leases and permits were in force.

Indian Estates

The estates of 183 deceased Indians were referred to the Branch, and the administration of 234 estates was concluded by the distribution of the estate assets.

Location Tickets and Enfranchisements

Four hundred and thirteen Location Tickets were issued to Indians who acquired interests on lands in Indian reserves through purchase from other Indians, inheritance, or allotment by Indian Band Councils.

There were 447 Indians enfranchised.

Petroleum and Natural Gas

While Indian reserves were unproductive of oil, exploration work by licensees and permittees continued, and contracts for exploration and development of petroleum and natural gas were in force on 19 Indian reserves in Alberta and Saskatchewan.

Receipts to Indian band funds from the said contracts totalled $113,371.02.

Timber and Forest Protection

Fifty-seven timber licences were in force at the beginning of the fiscal year, and of these 15 were completed. One was terminated by agreement, one was not renewed for delay in filing returns and failure to pay dues, and the remaining 40 were renewed. Fifteen new licences were issued, bringing the number of timber licences in force to 55.

Receipts from dues and ground rent under licence were $183,001.82, and from dues under permits to Indians, $115,756.27, making total receipts from timber $298,758.09.

Fifty forest fires were reported on Indian reserves, and timber destroyed in such fires was estimated to have a stumpage value of approximately $6,600. The amount spent in suppression of these fires was $18,243.70.

Fur Rehabilitation

Further extension of the program to rehabilitate wild fur bearers to preserve the livelihood of Indian trappers has continued with a marked increase in the areas brought under planned management.

Three of the large beaver preserves organized and managed in co-operation with the provinces are now in production and yielded the following amounts: Abitibi (Quebec), 1,070 pelts—$44,701; Nottaway (Quebec), 1,291 pelts—$55,865.70; and Kesagami (Ontario), 1,336 pelts—$43,968. Other preserves have made substantial progress toward reaching the production stage.

Negotiations have been conducted with Quebec for the addition of the Mistassini area of approximately 50,000 square miles to the large areas already under planned management as beaver producing areas.

Revision of the co-operative arrangements with Ontario, Quebec, Manitoba and Saskatchewan has been fully discussed with provincial administrative officers and substantial agreement reached, and new arrangements with all provinces are confidently expected to follow.

Provision has been made to augment the departmental field staff by adding a fur specialist to the staff of each regional supervisor. This is intended to make fur rehabilitation an integral part of the Federal administration, to provide trained liaison officers to work with provincial organizations already in the field, and to co-ordinate the joint effort to organize the Indians to fit into the registered trap-line programs already set up.

Several small muskrat ranching operations in the Prairie Provinces have been successfully continued. Value of production was: Onion Lake, 9,714 muskrats—$23,007.39; Sipanok, 7,028 muskrats—$18,852.47; and Summerberry, 12,701 muskrats—$26,697.80. In addition, a much larger sum was distributed to Indians through provincial agencies.

Trusts Division

The credit balance of the Indian Trust Fund on March 31, 1949, was $18,642,641.60, an increase of $81,192.33 over the previous year. Interest on trust funds paid by the Government of Canada at the rate of 5 per cent amounted to $938,803.81. In Alberta and Saskatchewan, the continued search for oil was an important source of revenue for the trust funds, $113,371.02 was received to the credit of Band Funds from contracts for exploration and development of petroleum and natural gas. Other sources of income were sale of land, land leases, mining licences, timber royalties, sale of gravel, repayments on Band Loans, and fines.

Items of expenditure were distributions of cash, relief, pensions awarded by Bands to destitute members, housing construction and repair, improvement of roads on reserves, farming, ranching, enfranchisements, and commutations. Where practicable, the expenditures were managed in such a way as to foster self-reliance and individual enterprise among the Indians.

Band projects in farming, fishing, lumbering, and house construction were formulated and developed, and under these projects Indians are enabled to work at current wage rates while receiving training and instruction. Special mention might be made of the Bersimis Fishery Project which showed a net profit for the year of $1,500 over and above the $2,794.91 paid to the Indians of the band for fish. With the hope of stimulating greater interest in this project, a bonus of five cents per pound, based on the number of pounds caught, was paid. Approximately 30 Indians participated in the project.

An innovation in Band Fund administration was the preparation by bands with fairly substantial funds of a budget of proposed expenditures for the fiscal year 1949-50. This was done in consultation with the superintendents. Hereto-

fore, the system generally followed was to consider the needs of a band as they arose without regard to anticipated requirements. The innovation has been most successful both from the point of view of giving Indian Councils some voice in the handling of band monies as well as enabling both the Band Council and the Department to have an opportunity to consider more carefully requests for expenditures from Band Funds.

Annuities

Annuity monies were distributed in accordance with the various treaties as follows:

No. of Chiefs paid at $25.00—172	$ 4,300.00
No. of Headmen paid at $15.00—380	5,700.00
No. of Indians paid at $5.00—52,093	260,465.00
No. of Indians paid at $4.00—155	620.00
No. of Indians paid at $12.00—2	24.00
No. of Commutations of Annuity paid at $50.00—106	5,300.00
No. of Enfranchised Indians paid $100.00 in lieu of Annuity—251	25,100.00
Amount paid on account of arrears for previous years	3,724.00
General Advance re Robinson Treaty to be added	13,250.00
Total	$318,483.00

In addition, there were 6,412 Indians who received annuity under the Robinson Treaty and 5,839 who received annuity under Treaty Nine (James Bay). This brings the number of Indians in Canada receiving treaty annuity to 65,053.

Personal Savings Accounts

There were approximately 2,072 individual Indian Savings Accounts in effect. The total on deposit has increased by $36,461.21. The following statement summarizes the year's transactions:

	Debit	*Credit*
April 1, 1948—Balance		$451,875.55
Government Interest		22,593.78
Deposits to savings		107,633.22
Withdrawals during year	$ 93,765.79	
March 31, 1949—Balance	488,336.76	
	$582,102.55	$582,102.55

Band Loans

Two hundred and forty-two Indians applied for loans from Band Funds, and of this number 200 received loans which totalled $56,024, the average loan being $280.12. The sum advanced was for the purposes and in amounts as follows:

For the purchase of live-stock and equipment, $20,194; for the purchase of property—land and buildings, $1,305; for repairs to buildings—houses, barns, etc., $15,875; for construction of new buildings, and the sinking of wells, $9,975; and for miscellaneous purchases, $8,675.

There were 85 band loans fully retired. Loan funds were set up from the capital funds of 13 additional bands, thus making a total of 69 Indian bands who have loan funds which range in size from $800 to $25,000.

Education Service

Pupil Enrolment and Attendance

Fiscal Year	Residential Schools		Day Schools		Total (All Schools)		
	Enrolment	Average Attendance	Enrolment	Average Attendance	Enrolment	Average Attendance	Percentage of Attendance
1938-39.....	9,179	8,276	9,573	6,232	18,752	14,508	77·36
1939-40.....	9,027	8,643	9,369	6,417	18,396	15,060	81·87
1940-41.....	8,774	8,243	8,651	6,110	17,425	14,353	82·37
1941-42.....	8,840	8,283	8,441	5,837	17,281	13,935	80·63
1942-43.....	8,830	8,046	8,046	5,395	16,876	13,441	79·64
1943-44.....	8,729	7,902	7,858	5,355	16,587	13,257	79·92
1944-45.....	8,865	8,006	7,573	5,159	16,438	13,165	80·09
1945-46.....	9,149	8,264	9,532	6,691	18,805	15,043	79·99
1946-47.....	9,304	8,192	10,181	7,344	19,622	15,641	79·91
1947-48.....	8,986	7,863	10,982	8,178	20,101	16,151	80·34
1948-49.....	9,368	8,345	12,511	10,320	21,983	18,769	85·33

It will be noted from the above statistics that enrolment at residential schools increased by 382 and at day schools by 1,529. This has resulted in a total increase during the year of 2,015 (including children enrolled in combined schools).

There are 925 Indian children in elementary grades and 377 Indian children in secondary grades in provincial and private schools. Added to the totals above, this means that there are 23,285 Indians enrolled in educational classes.

The increase in the percentage of attendance from 80·34 to 85·33 is also noteworthy. Children have been much more prompt in returning to Indian residential schools after the summer holidays. At Indian day schools, the attendance has steadily improved as a result of Family Allowance payments, the better calibre of teachers employed and improvements in classroom equipment and materials.

The building of new day schools and the opening of classroom blocks at residential schools continued at a steady pace. The number of day schools increased during the year from 285 to 309 and extra classrooms were added to several schools. In all, nearly 90 more classrooms were provided in day and residential schools.

The Special Joint Committee of the Senate and the House of Commons appointed to continue and complete examination and consideration of the Indian Act, in its Minutes of Proceedings and Evidence No. 5 covering the period Tuesday April 13, 1948, to and including Monday June 21, 1948, made the following recommendation concerning the operation of Indian Schools.

"Your Committee recommends the revision of those sections of the Act which pertain to education, in order to prepare Indian children to take their places as citizens.

"Your Committee, therefore, recommends that wherever and whenever possible Indian children should be educated in association with other children."

In line with this policy, the education division has been negotiating with school boards and Provincial Departments of Education for the training of Indian children in Provincial schools. The following statement shows the enrolment of Indian children in such schools in the elementary grades.

Indian Children Attending Provincial and Private Schools—Elementary Grades

Provinces	Grades								
	I	II	III	IV	V	VI	VII	VIII	Totals
Nova Scotia	7	1	6	3	4	4	.....	1	26
New Brunswick	3	3	5	5	4	4	2	1	27
Quebec	5	6	6	12	15	13	12	8	77
Ontario	44	52	46	39	27	28	10	10	256
Manitoba	36	8	5	3	2	5	1	.....	60
Saskatchewan	13	9	10	9	3	2	2	.....	48
Alberta	19	5	5	5	5	4	1	3	47
British Columbia	99	81	51	37	38	28	24	19	377
U.S.A.	1	1	2	.....	.....	.....	3	.....	7
Totals	227	166	136	113	98	88	55	42	925

The number of Indians receiving secondary education continues to increase at a satisfactory rate. In addition to 284 pupils enrolled in Indian schools for secondary education there are 377 in secondary grades attending provincial or private schools. This brings the total of Indians attending secondary schools and universities to 661.

The standard of teachers employed in Indian day schools continues to improve. The number of non-qualified, or Grade I, teachers decreased by 18 and the number of teachers holding First Class certificates increased by 36. This trend in the hiring of day school teachers will continue to be departmental policy with a view to the eventual elimination of non-certificated teachers. At the present time the implementation of this policy is made difficult by the serious shortage of qualified teachers across Canada.

The supply of school textbooks and materials improved, and schools were provided with teaching aids which were difficult to obtain during the immediate post-war years.

The provision of school lunch supplies has been extended and many day schools are now serving a hot meal daily. The distribution of vitamin biscuits was again made to day schools in northern Ontario, Manitoba, Saskatchewan, Alberta and the Northwest Territories.

Welfare Service

There was again a substantial increase in welfare expenditure over the previous year. This increase is accounted for by a further rise in commodity prices and increased costs of services rendered.

Summary

Province	1948-1949	1947-1948	1946-1947
Nova Scotia	$ 239,690.78	$ 224,857.91	$ 194,539.86
Prince Edward Island	17,098.44	21,603.46	14,306.17
New Brunswick	117,992.98	83,821.89	56,109.09
Quebec	333,308.03	208,272.89	175,716.27
Ontario	333,006.78	239,062.21	197,667.92
Manitoba	260,853.16	242,942.87	153,602.31
Saskatchewan	214,197.99	132,162.63	121,710.82
Alberta	185,323.76	152,714.33	105,412.40
British Columbia	474,920.14	195,863.47	132,253.52
Northwest Territories	60,558.08	34,471.14	22,047.79
Yukon Territory	25,677.73	14,011.56	10,668.31
Headquarters Salaries	37,974.34	33,250.61	29,050.82
Triennial Clothing	6,499.74	5,091.41	3,985.83
Handicraft	830.14	711.12	1,944.92
Miscellaneous	9,482.74	18,177.39	11,852.02
	$2,317,414.83	$1,607,014.89	$1,230,868.05
Net Increase 1948-1949 over 1947-1948			$710,399.94
" " 1947-1948 over 1946-1947			$376,146.93

The general policy followed by the Indian Affairs Branch is one of assisting Indians to be self-supporting and self-reliant. Whenever possible, financial aid is given to Indians to assist them in worthwhile fields of endeavour, in preference to direct relief.

Although much still remains to be done in the housing field, $651,811.94 was expended on repairs to existing structures and construction of new homes on Indian reserves. When consideration is given to the fact that much of the lumber was sawn by departmentally-owned mills on Indian reserves, and all able-bodied Indians are required to provide necessary labour insofar as it is possible for them to do so, it will be realized that a great deal more can be accomplished per dollar than would otherwise be the case.

Steps were taken to organize the fishing industry in so far as it affects Indians residing in northern Alberta and the Northwest Territories. Lake Athabasca was opened to commercial fishing subject to special restrictions favouring local Indian residents. The opening of the Mackenzie Highway and commercial fishing in Great Slave Lake, N.W.T., has provided a substantial source of income to Indians residing in that area. Steps have been taken, through the co-operation of the Northwest Territories Administration and the Department of Fisheries, to reserve fishing grounds for the domestic use of natives and other local residents adjacent to the principal settlements touching Great Slave Lake.

The fourth annual convention of Indian Homemakers' Clubs in eastern Canada was held on the Indian reserve at Golden Lake, Ontario, in June.

Grants to Agricultural Exhibitions and Indian Fairs

	1948-49	1947-48
Ontario		
Ohsweken Agricultural Society, Brantford	$ 225.00	$ 225.00
Moravian Agricultural Society	100.00	....
Garden River Agricultural Society, Sault Ste. Marie	100.00	100.00
Caradoc United Indian Fair, Muncey	150.00	150.00
Manitoulin Island Unceded Agricultural Society	150.00	150.00
Canadian Lakehead Exhibition	250.00	250.00
Mohawk Agricultural Society, Deseronto	100.00	100.00
Manitoba		
Manitoba Provincial Exhibition	250.00	150.00
Rossburn Agricultural Society	25.00	25.00
Swan Lake Exhibition	25.00	....
Saskatchewan		
Prince Albert Agricultural Society	500.00	400.00
Regina Agricultural and Industrial Exhibition Association, Ltd.	500.00	400.00
Alberta		
Calgary Exhibition	500.00	500.00
Edmonton Exhibition	500.00	500.00
British Columbia		
North and South Saanich Agricultural Society, Cowichan	50.00	50.00
Windermere and District Fall Fair, Kootenay	175.00	175.00
Chilliwack Agricultural Association, Chilliwack, B.C.	150.00	150.00
Armstrong Fall Fair, Okanagan	250.00	250.00
Bulkley Valley Agricultural and Industrial Association	100.00	100.00
Vancouver Exhibition	500.00	500.00
Cowichan Agricultural Society	150.00	....
General		
The Canadian Handicrafts Guild	100.00	50.00
Garden Prizes, Standing Crop Competitions ..	1,500.00	1,500.00
Home Improvement Competition	1,000.00	1,500.00
Ploughing Matches—Expenses of Indian Competitors	150.00	150.00
	$7,500.00	$7,475.00

Handicraft

The increase in tourist travel in Canada brought a gratifying increase in the sale of Indian craft goods, and it has been possible to provide increased employment for Indians belonging to those reserves on which craft projects have been organized.

In addition to the production of basketry, barkwork, and woodwork, Indian women in six agencies have been provided with employment in making hospital garments purchased by the Department of Health and Welfare for use in Indian hospitals throughout the country. These activities are carried on through the co-operation of the various Homemakers' Clubs, and the work of the Indian women showed a steady improvement.

Family Allowances

Registration and Method of Payment

The following table shows the number of Indian families and children registered for Family Allowances in Canada, as at December 31, 1948, together with the method of payment.

Province	Families Registered	Children Registered	Method of Payment			
			A	B	C	D
P.E.I.	38	116	38	.....	.....	.....
Nova Scotia	388	1,086	378	.....	10	.....
New Brunswick	336	931	321	.....	15	.....
Quebec	1,812	5,075	681	176	119	836
Ontario	4,282	12,201	2,948	193	75	1,066
Manitoba	2,608	7,783	1,931	605	10	62
Saskatchewan	2,476	7,200	1,491	588	50	347
Alberta	2,099	6,296	926	915	39	219
British Columbia	4,179	11,860	3,701	86	301	91
Yukon and N.W.T.	803	2,076	7	.....	.....	796
	19,021	54,624	12,422	2,563	619	3,417

The number of families registered shows an increase of 504, and the number of children in pay an increase of 3,094 over last year.

In analysing the method of payment the following percentage breakdowns are significant:

(*a*) cheque direct to the Indian, ...	12,422	
(*b*) cheque direct to the Indian,, mailed c/o the Indian Agency	2,563	
		14,985—78·7 per cent
(*c*) administered through Indian Agency Trust Account		619— 3·3 per cent
(*d*) allowances in kind		3,417—18·0 per cent
		19,021

Payment in Kind

This method of payment, in effect for 18 per cent of all Indian families, has in the past four and a half years permitted the introduction of new and nutritious foods to the more remote bands. Such foods as milk, tomatoes and pablum, largely unknown prior to Family Allowances, are now familiar in the far north and constitute a large percentage of Family Allowances expenditures made under the control of this type of payment. It has, moreover, enabled the strongest emphasis to be placed on the use of Family Allowances exclusively for the children.

Vital Statistics

Steady progress toward the goal of complete registration of birth for Indian children in receipt of Family Allowances has been made during the past year in all provinces where the Indian Superintendent is recognized by the provincial authorities as a Registrar of Vital Statistics for the Indian population.

In Quebec, progress has been particularly gratifying in that a backlog of 2,205 unverified births was reduced 75 per cent. It is expected that delayed registrations will be effected for the remaining 650 children during the coming year.

Allowances to Aged Indians

In addition to the various types of relief and assistance already available to aged Indians, a special allowance of $8 a month was initiated, effective September 1, 1948.

Conditions governing payment are lenient, requiring principally that the Indian has attained his seventieth birthday and whose income, if any, does not exceed $400 per annum, inclusive of allowance.

The following chart shows the number of recipients of the allowances to aged Indians and the method of payment as of March 31, 1949:

Province	Number of Aged Indians in Pay	Method of Payment		
		Cheque Direct	Cheque Direct c/o Indian Agency	Administered Agency Trust Account
P.E.I.	10	10		
Nova Scotia	80	80		
New Brunswick	54	54		
Quebec	356	173	183	
Ontario	908	693	204	11
Manitoba	505	494	8	3
Saskatchewan	449	399	34	16
Alberta	461	167	274	20
British Columbia	911	850	45	16
Yukon and N.W.T.	116	108	8	
	3,850	3,028	756	66

Since the inception of this allowance, an average of 30 deaths a month have been recorded for a total of 209.

Re-Establishment of Indian Veterans

The number of new applications for grants under the Veterans' Land Act declined approximately 50 per cent. There was also a reduction in the number of applications for supplementary grants from veterans who had not obtained the maximum amount of $2,320 in their original applications.

Of the 938 applications approved, 155 have completely expended the total permissible grant of $2,320. These will be subject to supervision until a period of 10 years has elapsed from the date on which settlement of the veteran who obtained the grant commenced.

Although the number of applications is decreasing, the work involved in administering the grants presently approved continues to grow. It is anticipated that should employment conditions deteriorate many Indian veterans now gainfully employed will return to their reserves to take up settlement on the land under the Veterans' Land Act.

It is interesting to note that the Indian chiefs and councillors in Qu'Appelle Indian Agency, Saskatchewan, who refused to allot land to veterans for settlement under this Act have recently changed their attitude, and applications from this group of Indian veterans are now being submitted. These chiefs and councillors claimed that the allotment of specific areas to individuals was an attempt on the part of the Branch to break up their reserves and ultimately dispossess them of their land. The successful settlement of veterans on reserves in adjoining agencies and pressure from their own veterans has apparently convinced them of the advantages available to veterans under the Veterans' Land Act but they are still suspicious of an ulterior motive. It is hoped that time and successful settlement of their own veterans will ultimately convince them that the only object of the Veterans' Land Act is to assist veterans to become successfully re-established on the land.

The following table shows the details of total grants to date and the increase for the year:—

Purpose of Grant	Number of Veterans	Total Value	Average Value
		$	$
Land and Buildings	224	179,532	801
Building Materials	696	771,412	1,108
Clearing	143	57,673	403
Livestock and Equipment	568	722,302	1,272
Forestry Equipment	6	9,495	1,583
Commercial Fishing Equipment	109	162,446	1,490
Fur Farming Equipment	55	28,412	517
Household Equipment	557	122,868	221
		2,054,140	

Total Grants

	1948	*1949*
Original grants approved	164	938
Supplementary	103	..
Amount	$ 465,284.	$2,054,140.
Expenditures	$ 630,623.	$1,562,215.

Average Grant $2,190.

Construction and Engineering Work

Agency Buildings

Repairs and improvements, including painting, were made on many Indian Agency buildings throughout Canada and extensive repairs, improvements or additions were made as follows: residence for superintendent on Kingsclear Indian Reserve, New Brunswick West Agency, New Brunswick, was remodelled; an addition to house generating and pumping equipment was provided at Christian Island, Ontario; residences at Pointe Bleue and Timiskaming Agencies, Quebec, were insulated; an addition to The Pas Indian Office, Manitoba, was built; a warehouse to provide an office for Meadow Lake Agency, and residences in Battleford and Carlton Agencies, Saskatchewan, were insulated; plumbing was installed in superintendent's residence at Telegraph Creek, Stikine Agency, British Columbia, and equipment for installation of hot and cold domestic water supply was acquired for the superintendent's residence at Fort Norman, Northwest Territories.

New buildings constructed were:

Prince Edward Island

A residence for the superintendent, and office, store and pump house were built at Lennox Island Indian Agency; a barn was moved and utilized as a storehouse.

Nova Scotia

An addition to the office and warehouse building was built to provide living quarters for a storekeeper. A store and a residence for a clerk were also provided at Shubenacadie Agency.

Quebec

Residences were built for the superintendents of the Restigouche and St. Regis Indian Agencies, and a combined garage and warehouse was built for the Abitibi Agency.

Ontario

A warehouse, shed and tool house were built at the James Bay Agency, and the construction of a combined office and warehouse building was commenced (under supervision of the Department of Public Works); the R.C.M.P. residence at Manitowaning was completed; an addition to the Caradoc Indian Office was built; and, in conjunction with the Public Works Department, a boathouse was built for the Fort Frances Agency boat.

Manitoba

An implement shed was built at the Clandeboye Agency; materials were purchased and delivered to the site of a residence for the assistant at the Nelson House Reserve, The Pas Indian Agency; and a residence for the superintendent of the Nelson River Agency was constructed at Ilford.

Saskatchewan

A residence and garage were built at the Meadow Lake Agency for the superintendent. A garage was built at File Hills-Qu'Appelle Agency; a root house was provided at Nut Lake Reserve, Touchwood Agency, and warehouses were built for Muscowequan and Poorman's Reserves also in Touchwood Agency; and a residence for the assistant at the Big River Reserve, Duck Lake Agency, was erected.

Alberta

A residence for the clerk and warehouse were provided at the Fort Chipewyan settlement; a residence for the assistant at Stony Rapids and a ration house were built, and a ration house at Fond du Lac, all in the Athabasca

Indian Agency; a residence at Belly River Camp, Blood Agency, was built; a residence for the clerk at Hobbema Agency, and a residence for the stockman, Peigan Agency, were constructed; materials for a residence for the assistant, Wabasca Indian Reserve, Lesser Slave Lake Agency, were purchased and delivered to the site of the work.

British Columbia

A duplex was erected to provide the clerk's living quarters; office, garage and warehouse at Telegraph Creek, Stikine Agency, and a pump house and power house were also built; a boathouse on Babine Lake and an office building, Babine Agency, Hazelton, were built.

Lands and Buildings Purchased

A residence was purchased in Sarnia, Ontario, for the superintendent; a residence for the superintendent of the Dauphin Agency was purchased in Dauphin, Manitoba; land was acquired in The Pas as a further site for agency buildings; and property was acquired as a site for the superintendent's residence at Ilford, Manitoba; a residence for the superintendent of the File Hills-Qu'Appelle Agency and property adjoining it was purchased in Fort Qu'Appelle, Saskatchewan; a residence in Fort Vermilion was acquired for the superintendent of the Fort Vermilion Agency, and a residence for the superintendent of the Saddle Lake Agency was purchased in St. Paul, Alberta.

Roads and Bridges

Road work was carried out on many Indian reserves and particular attention was paid to improving roads in the St. Regis and Caughnawaga Agencies, in Quebec; Walpole Island, Caradoc, Port Arthur, Tyendinaga, Six Nations and Sault Ste. Marie Agencies in Ontario; Portage la Prairie Agency, in Manitoba; and Blood and Edmonton Agencies in Alberta. In co-operation with the Provincial Government, construction of a bridge over the Fisher River at Koostatak, Fisher River Agency, Manitoba, was commenced.

Road building and maintenance equipment was acquired for the use of the Caradoc, Walpole Island and Sarnia Agencies in Ontario, all reserves in Saskatchewan, and Williams Lake Agency in British Columbia.

Water Systems for Indian Reserves

A number of water supply systems were provided for Indian reserves in British Columbia and a report in regard to them will be found in the report of the Lands and Development Services Branch. The work undertaken by Indian Affairs Branch included improving a well on the Kingsclear Indian Reserve, New Brunswick, work on Lorette waterworks system, Quebec, stock watering dams and dugouts at Blood and Peigan Agencies in Alberta, a well at Pelly Agency, Saskatchewan, and Saddle Lake Agency, Alberta.

Irrigation Systems

The Lands and Development Services Branch were provided with funds for the construction and maintenance of irrigation systems in British Columbia and repairs and improvements to other systems were carried out by the Indian Affairs Branch.

Telephone Lines and Power Lines

Electric power was provided to the Indian village of St. Regis and at the new Meadow Lake Agency, Saskatchewan. Telephone lines were constructed from East Bay to the Eskasoni Agency, Nova Scotia, Alexander's Reserve, Edmonton Agency, Alberta, and Nut Lake Reserve, Touchwood Agency, Saskatchewan. A power line was built to the Hobbema Agency, Alberta, and the Peigan Agency, Alberta.

Indian Health Services

The health of all Indians and Eskimos is the concern of the Indian Health Services of the Department of National Health and Welfare and is dealt with in greater detail in the report of that Department.

The birth rate of Indians varies between groups but is generally appreciably above that of the white population. The death rate is similarly high but not as high proportionately, so that there is a consistent net increase in population.

The professional staff of the Indian Health Services consisted of 51 medical officers, 5 dental surgeons, 54 graduate nurses in field service and 123 graduate nurses in departmental hospitals which provide 1,756 beds. There were 13 dispensaries and 18 nursing stations where as many as four patients may receive temporary bed care. Eleven of the nursing stations were brought in operation during the year and 291 new hospital beds made available.

The greatest effort was devoted to procedures destined to improve the general health of children and adults by prevention or early detection of disease. Extensive X-ray surveys were carried out in every region and those suspected of incipient or active tuberculosis were admitted to care as quickly as beds could be found. Indian Health Services pioneers in the use of Bacillus Calemette Guerin vaccine which increases the resistance of children to the tubercle bacillus. This work extended rapidly during the year.

There were no serious epidemics, although the usual incidence of childhood disease occured and influenza spread through northern Ontario and Manitoba. Deaths from these were rare.

A step of far reaching significance, both medically and socially, was the inclusion of the Indians of British Columbia in the Hospital Insurance Plan of that Province. This places the Indians on equal terms with all other residents of the Province for the hospital care of acute disease.

While the professional care of the aborigine is organized by Indian Health Services, the superintendents of agencies and their staffs take the keenest interest in health matters and the admitted improvement in general health has been due in the greatest degree to their energetic prosecution of sanitary and preventive measures within their individual spheres of influence.

Summary of Indian Agencies by Provinces

The local administration of Indian lands on the reserves scattered throughout the Dominion is conducted through the Department's 92 agencies. The number of bands included in an agency varies from one to more than 30. In addition to the superintendent, the staff of an agency may include various officers, such as a clerk, stenographer and assistants, according to its special requirements. Medical staff is provided for agencies, as required, by the Department of National Health and Welfare. The work of the agencies is supervised by the Department's regional supervisors. There is an Indian commissioner at Vancouver, acting in a supervisory capacity for British Columbia.

Prince Edward Island

The only agency is located on Lennox Island. A large number of Indians live on Lennox Island, and others live at Rocky Point, near Charlottetown, Morell, St. Andrews, and Scotch Fork. In tribal origin, the Indians are of the Micmac tribe, of Algonkian stock.

Nova Scotia

There are two agencies, Shubenacadie, at Micmac, and Eskasoni, at Eskasoni. Like the Indians of Prince Edward Island, those of Nova Scotia also bear the distinctive name of Micmac, and are of the Algonkian stock.

New Brunswick

The three agencies are the Northeastern, at Rogersville; the Northern, at Perth; and the Southwestern, at Kingsclear. The Indians are mostly Micmacs, though there are some bands of Maliseets, also of Algonkian stock.

Quebec

The 17 Indians agencies are located as follows: Abitibi, at Amos; Becancour, at Gentilly; Bersimis, at Betsiamites; Cacouna, at Viger; Caughnawaga, at Caughnawaga; Gaspé, at Gaspé; Lorette, at Village des Hurons, Maniwaki, at Maniwaki; Mingan, at Mingan; Natashquan, at Natashquan; Pierreville, at Pierreville; Pointe Bleue, at Pointe Bleue; Restigouche, at Restigouche; St. Augustin, at St. Augustin; St. Regis, at St. Regis; Seven Islands, at Seven Islands; and Timiskaming, at Notre Dame du Nord.

The principal tribes found in Quebec are: Iroquois at Caughnawaga, Lake of Two Mountains, and St. Regis; the Hurons of Lorette, also of Iroquoian stock; the Montagnais, of Algonkian stock, at Bersimis, Mingan, Lake St. John, Seven Islands, and Abitibi; the Têtes de Boule, of Algonkian stock, at Abitibi; the Abenakis, of Algonkian stock, at Becancour; the Micmacs, of Algonkian stock, at Maria and Restigouche; the Maliseets, of Algonkian stock at Viger; and the Naskapis, also of Algonkian stock, in the northern area.

Ontario

The 23 Indian agencies are located as follows: Cape Croker, at Wiarton; Caradoc, at Muncey; Chapleau, at Chapleau; Christian Island, at Christian Island; Georgina, at Virginia; Golden Lake, at Golden Lake; Fort Frances, at Fort Frances; James Bay, at Moose Factory; Kenora, at Kenora; Manitoulin Island, at Manitowaning; Moravian, at Highgate; Nipissing, at Sturgeon Falls; Parry Sound, at Parry Sound; Port Arthur, at Port Arthur; Rama, at Longford Mills; Rice and Mud Lakes, at Peterborough; Sarnia, at Sarnia; Saugeen, at Chippewa Hill; Sault Ste. Marie, at Sault Ste. Marie; Sioux Lookout, at Sioux Lookout; Six Nations, at Brantford; Tyendinaga, at Deseronto; and Walpole Island, at Walpole Island.

Most of the Indians of Ontario are of the Ojibwa, Chippewa, and Mississauga tribes, all of Algonkian stock. There is a band of Algonkians at Golden Lake. The Oneidas of the Thames, the Mohawks of the Bay of Quinte, the Mohawks of Parry Sound district, and the Six Nations of Grand River are of Iroquoian stock. There is a band of Pottawottamies at Walpole Island, and of Delawares at the Caradoc (Muncey) Agency; these are of Algonkian stock. Crees, also of Algonkian stock, are found in northern and northwestern Ontario.

Manitoba

There are seven agencies located as follows: Clandeboye, at Selkirk; Dauphin, at Dauphin; Fisher River, at Hodgson; Nelson River, at Ilford; Norway House, at Norway House; Pas, at The Pas; and Portage la Prairie, at Portage la Prairie.

Manitoba Indians are mostly Ojibwas and Crees of Algonkian stock. Bands of Swamp Crees found at the Norway House and Fisher River Agencies and in the York Factory district are also of Algonkian stock. The Indians located at the Griswold Agency are Sioux; there are also Sioux at the Birtle and Portage la Prairie Agencies. There is a band of Chipewyans at Churchill of Athapaskan stock.

Saskatchewan

The following are the eight agencies: Battleford, at Battleford; Carlton, at Prince Albert; Crooked Lake, at Broadview; Duck Lake, at Duck Lake; Meadow Lake, at Meadow Lake; Pelly, at Kamsack; File Hills—Qu'Appelle, at Fort Qu'Appelle; and Touchwood, at Punnichy.

The most numerous tribes among the Saskatchewan Indians are Ojibwas, Swamp Crees, and Plains Crees, all belonging to the Algonkian stock. In addition to these, Sioux Indians are found at Crooked Lake, Qu'Appelle, and Carlton Agencies, and on the Moose Woods Reserve. In the Onion Lake Agency, there is a band of Chipewyans who are of Athapaskan stock. There are also a few Chipewyan Indians in the Ile à la Crosse district.

Alberta

Locations of the nine agencies are: Athabasca, at Fort Chipewyan; Blackfoot, at Gleichen; Blood, at Cardston; Edmonton, at Winterburn; Fort Vermilion, at Fort Vermilion; Hobbema, at Hobbema; Lesser Slave Lake, at High Prairie; Saddle Lake, at St. Paul; and Stony-Sarcee, at Morley.

The Alberta Indians are of Algonkian stock, with the exception of the Sarcees near Calgary and the Beavers and Slaves in the Lesser Slave Lake Agency, who are Athapaskan; the Paul's Band in the Edmonton Agency, who are Iroquoian; and the Stonies, who are of Siouan stock. The Algonkian Indians of Alberta are subdivided into Blackfoot Nation, comprising the Indians of the Blackfoot, Blood, and Peigan Agencies; and Plains Crees found in the Lesser Slave Lake, Saddle Lake, Edmonton, and Hobbema Agencies.

British Columbia

There are 18 agencies, located as follows: Babine, at Hazelton; Bella Coola, at Bella Coola; Cowichan, at Duncan; Fort St. John, at Fort St. John; Kamloops, at Kamloops; Kootenay at Cranbrook, Kwawkewlth, at Alert Bay; Lytton, at Lytton; New Westminster, at New Westminster; Nicola, at Merritt; Okanagan, at Vernon; Queen Charlotte, at Masset; Skeena, at Prince Rupert; Stikine, at Telegraph Creek; Stuart Lake, at Vanderhoof; Vancouver, at Vancouver; West Coast, at Port Alberni; and Williams Lake, at Williams Lake.

The Indians of the Bella Coola, Cowichan, Kamloops, Lytton, New Westminster, Nicola, Vancouver, and Okanagan Agencies belong to the Salish tribes. The Kootenay tribe is located in the agency of the same name. The Kwakiutl-Nootka tribe is located at the Kwawkewlth and West Coast Agencies, the Haidas in the Queen Charlotte Islands, the Tlingits in the Stikine Agency, and the Tsimshians in the Skeena Agency. The Indians of the Babine, Stuart Lake, Fort St. John, and Williams Lake Agencies belong mostly to the Athapaskan race. The Indians of the Peace River Block are Athapaskan, with the exception of a small group of Saulteaux and Crees at Moberly Lake who are Algonkian.

Northwest Territories

The three agencies are as follows: Fort Norman, at Fort Norman; Fort Resolution, at Yellowknife; Fort Simpson, at Fort Simpson.

The principal tribes found in the Northwest Territories are the Slaves, Hares, Loucheaux, Dogribs, Sekani, Yellow Knives, Chipewyans, and Caribou-Eaters. All these tribes are of Athapaskan stock. The most northerly tribes are the Takudah, whose territory extends to the Mackenzie Delta, and the Copper Mines, who are located along the Coppermine River. The territory occupied by these two last-named tribes is contiguous to that inhabited by the Eskimos.

Yukon Territory

There is one agency, at Whitehorse. The Forty-Mile, Blackstone, and Moosehide Bands belong to the Takudah tribe. There is a band of Slaves at Lancing Creek who migrated from Good Hope on the Mackenzie River; another band of Slaves, called Nahani, is located at the headwaters of Pelly River. All these Indians are of Athapaskan stock. At Mayo, Selkirk, Little Salmon, and Carmacks there are bands belonging to the tribe known as Stick Indians. Bands belonging to the Tlingit tribe are found at Whitehorse, Teslin Lake, Champagne Landing, and Carcross.

Table No. 1

Census of Indians: Arranged Under Provinces and Territories, 1949

Province	Number in Band	Religion							Under 7 years		From 7 to 16 inclusive		From 17 to 21 inclusive		From 22 to 65 inclusive		From 65 years upwards	
		Anglican	Baptist	United Church	Presbyterian	Roman Catholic	Other Christian Beliefs	Aboriginal Beliefs	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Alberta	12,441	1,518	.....	1,537	.....	6,347	.....	72	1,380	1,439	1,551	1,515	581	571	2,495	2,224	309	376
British Columbia	25,515	5,831	.....	4,425	62	14,465	694	38	2,350	2,573	3,056	3,171	1,238	1,127	5,548	4,808	825	819
Manitoba	15,933	5,791	52	3,438	528	5,388	438	298	1,663	1,665	1,828	1,711	1,020	1,005	3,102	2,923	461	555
New Brunswick	2,047	.....	.....	.....	.....	2,047	.....	.....	210	202	244	238	109	105	445	414	46	34
Northwest Territories	3,816	667	.....	.....	.....	3,149	.....	.....	374	403	434	436	212	209	775	745	90	138
Nova Scotia	2,364	6	.....	.....	1	2,357	.....	.....	259	259	231	240	130	131	534	457	65	58
Ontario	32,421	10,494	1,281	5,025	307	10,338	1,147	2,929	2,630	2,739	3,189	3,351	2,094	2,101	7,283	6,904	1,042	1,088
Prince Edward Island	266	.....	.....	.....	.....	266	.....	.....	27	22	28	34	14	15	57	57	5	7
Quebec	15,194	2,932	.....	557	1	11,517	93	94	1,319	1,360	1,750	1,718	804	878	3,471	3,010	463	421
Saskatchewan	14,158	4,804	.....	1,499	163	6,934	42	716	1,572	1,611	1,683	1,646	642	639	2,828	2,779	355	403
Yukon Territory	1,531	1,224	.....	.....	.....	307	.....	.....	147	157	180	195	74	71	331	278	54	44
Total Indian Population	125,686	33,267	1,333	17,381	1,062	63,115	2,414	4,147	11,931	12,430	14,174	14,255	6,918	6,852	26,869	24,599	3,715	3,943

Table No. 2

Land, Property and Live Stock, Fiscal Year Ended March 31, 1949

Bands	Land				Property				Live Stock						
									Horses			Cattle			
	Total Area of Reserve (Acres)	Acres Under Wood	Acres Cleared but Not Cultivated	Acres Under Actual Cultivation	Private Houses	Churches	Council Houses	Saw Mills	Stallions	Geldings and Mares	Foals	Bulls	Steers	Milch Cows	Young Stock
Prince Edward Island	2,741	1,320	800	200	31	1	1	.....	.....	9	1	1	1	9	7
Nova Scotia	19,429	16,870	999	456	451	11	1	2	1	45	1	1	7	67	28
New Brunswick	37,726	33,242	1,176	325	368	4	4	1	.....	25	.....	.....	.....	6	3
Quebec	179,057	139,299	14,339	9,289	2,239	26	5	.....	1	545	65	64	65	1,432	770
Ontario	1,330,977	862,108	119,541	27,147	4,853	114	45	21	31	2,176	147	72	599	2,502	1,443
Manitoba	525,299	257,718	162,941	17,815	3,082	68	13	10	2	2,303	66	31	271	1,161	766
Saskatchewan	1,202,454	508,387	637,492	74,411	2,752	56	16	2	1	5,957	128	80	1,083	2,292	1,883
Alberta	1,455,790	421,568	782,287	71,767	2,573	33	11	4	168	8,677	1,458	294	2,482	7,924	3,662
British Columbia	814,936	445,044	246,452	42,193	6,831	170	84	84	90	6,611	952	246	7,446	4,133	6,808
Northwest Territories and Yukon	5,620	3,280	23	14	439	1	1	.....	2	10	.....	.....	.....	.....	.....
	5,574,029	2,688,836	1,966,050	243,617	23,619	484	181	124	296	26,358	2,818	789	11,954	19,526	15,370

Table No. 3

Statement of Ordinary and Special Expenditures Year 1948-49

—	Branch Administration	Indian Agencies	Reserves and Trusts Admin.	Welfare	Education	Grants to Residential Schools	Grants to Exhibitions	Total
	$	$	$	$	$	$	$	$
Nova Scotia	.....	80,684	645	239,691	67,815	37,222	35	426,092
Prince Edward Island	.....	38,105	.....	17,098	41,823	.....	.....	97,026
New Brunswick	.....	42,834	130	117,993	36,630	.....	95	197,682
Quebec	2,030	169,422	1,235	333,308	394,777	33,226	206	934,204
Ontario	2,295	281,810	16,134	333,007	496,063	371,023	1,283	1,501,615
Manitoba	.....	216,924	3,553	260,853	324,527	244,964	442	1,051,263
Saskatchewan	.....	277,612	9,461	214,198	315,807	428,676	1,220	1,246,974
Alberta	.....	335,960	71,067	185,324	336,418	485,003	1,130	1,414,902
British Columbia	3,915	275,388	3,434	474,920	406,747	522,294	950	1,687,648
Northwest Territories	.....	33,026	.....	60,558	373,001	88,013	.....	554,598
Yukon Territory	.....	10,734	.....	25,678	56,474	21,837	.....	114,723
Headquarters and Miscellaneous	116,585	49,159	57,313	54,787	300,906	.....	8	578,758
British Columbia Special	.....	33,405	.....	44,450	19,765	.....	.....	97,620
	124,825	1,845,063	162,972	2,361,865	3,170,753	2,232,258	5,369	9,903,105
Pensions and Gratuities	.....	.....	.....	.....	.....	.....	.....	660
Statutory—Indian Annuities	.....	.....	.....	.....	.....	.....	.....	318,483
Statutory—Pensions	.....	.....	.....	.....	.....	.....	.....	510
To re-imburse the Blackfoot Band of Indians for an expenditure in 1930 out of band funds for the re-construction of The Old Sun Residential School with interest at 5% per annum	.....	.....	.....	.....	.....	.....	.....	156,669
Total Ordinary Expenditure	.....	.....	.....	.....	.....	.....	.....	10,379,427

Table No. 4

Statement of Special Expenditures Year 1948-49

FUR CONSERVATION

Quebec	$ 39,081
Ontario	16,076
Manitoba	44,924
Saskatchewan	64,507
Alberta	18,467
British Columbia	3,770
Northwest Territories	
Head Office	19,944
Total Special Expenditure	206,769
Total Ordinary Expenditure	10,379,427
Grand Total Ordinary and Special Expenditure	10,586,196

Table No. 5

Open Account—Advances for Assistance to Indians, Fiscal Year Ended March 31, 1949

EXPENDITURE

British Columbia	$ 1,930.37	
Saskatchewan	16,672.68	
Manitoba	—	
Ontario	442.16	
Quebec	3,307.00	
Nova Scotia	4,857.11	
Prince Edward Island	3,309.34	
		$30,518.66

REPAYMENTS

British Columbia	220.10	
Saskatchewan	14,504.80	
Manitoba	6.00	
Ontario	599.60	
Quebec	1,002.29	
Nova Scotia	3,133.19	
Prince Edward Island	319.74	
		$19,785.72
Expenditure over Repayments...		$10,732.94

Table No. 6

Indian Trust Fund, Fiscal Year Ended March 31, 1949

Balance April 1, 1948.....	.....	$ 18,561,449.27
Collections on land sales, timber and stone, dues, rents, fines, fees, etc.....	.....	1,880,615.48
Interest for the year ended March 31, 1949	.....	938,803.81
Credit transfers during the year	.....	52,883.32
Expenditure during the year.	$ 2,752,953.94	.....
Transfers by warrant, etc..	38,156.34	
Balance March 31, 1949.....	18,642,641.60	.....
	$ 21,433,751.88	$ 21,433,751.88

Table No. 7

Annuities Paid during the Fiscal Year Ended March 31, 1949

Alberta	$ 77,578.00
Manitoba	106,415.00
Northwest Territories	18,200.00
Ontario	41,120.00
Saskatchewan	75,170.00
	$318,483.00

Table No. 8

Indian Education Ordinary Expenditure 1948-49

—	Day Schools	Residential Schools	General	Total
	$	$	$	$
Nova Scotia	39,874 92	65,162 66	.....	105,037 58
Prince Edward Island	41,823 46	.....	.....	41,823 46
New Brunswick	36,629 57	.....	.....	36,629 57
Quebec	395,239 29	32,763 40	.....	428,002 69
Ontario	418,409 40	448,676 90	.....	867,086 30
Manitoba	266,047 58	303,443 30	.....	569,490 88
Saskatchewan	144,999 19	599,483 81	.....	744,483 00
Alberta	92,743 90	728,677 11	.....	821,421 01
British Columbia	337,830 70	591,210 38	.....	929,041 08
British Columbia Vocational Instruction	.....	.....	19,765 62	19,765 62
Northwest Territories	371,664 43	89,349 78	.....	461,014 21
Yukon Territory	19,334 68	58,976 46	.....	78,311 14
Assistance to Ex-pupils	.....	.....	106,637 72	106,637 72
Freight and Express	.....	.....	1,593 45	1,593 45
Salaries and Travel	.....	.....	174 33 45,372 85	45,547 18
Stationery	.....	.....	141,609 22	141,609 22
Miscellaneous	.....	.....	5,518 13	5,518 13
	2,164,597 12	2,917,743 80	320,671 32	5,403,012 24

Table No. 9

Statement Showing Enrolment by Provinces in the Different Classes for the Fiscal Year Ended March 31, 1949

RESIDENTIAL SCHOOLS

Province	Denominations					Number on Roll			Average Attendance	Percentage of Attendance	Grades											
	Number of Schools	Church of England	Presbyterian	Roman Catholic	United Church	Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Nova Scotia	1	.....	.....	1	.....	71	87	158	140·70	89·05	41	21	34	21	16	16	6	.....	3	....	....	.....
Quebec	2	1	.....	1	.....	53	32	85	58·00	68·23	16	17	19	5	9	13	6	.....	....	....	....	.....
Ontario	12	5	1	6	.....	809	821	1,630	1,454·90	89·26	513	208	196	180	152	88	100	91	58	36	8	.....
Manitoba	8	1	1	4	2	478	607	1,085	953·83	87·91	317	152	155	118	109	105	64	28	37	....	....	.....
Saskatchewan	12	2	.....	8	2	905	957	1,862	1,741·23	93·51	587	239	260	228	214	151	96	52	34	1	....	.....
Alberta	19	5	.....	12	2	983	1,130	2,113	1,742·99	82·49	654	354	316	256	237	159	80	46	11	....	....	.....
Northwest Territories	4	1	.....	3	.....	108	138	246	215·34	87·54	114	46	28	27	19	10	.....	.....	2	....	....	.....
British Columbia	13	2	.....	9	2	1,038	1,105	2,143	1,994·49	93·07	525	394	292	288	227	161	123	67	54	11	1	.....
Yukon Territory	1	1	.....	.....	.....	23	23	46	43·36	94·26	12	12	2	9	5	3	2	1	....	....	....	.....
Totals, Residential Schools	72	18	2	44	8	4,468	4,900	9,368	8,344·84	89·08	2,779	1,443	1,302	1,132	988	706	477	285	199	48	9	.....

Table No. 9—*Continued*

DAY SCHOOLS

Province	Number of Schools	Number on Roll			Average Attendance	Percentage of Attendance	Grades											
		Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Prince Edward Island	1	26	21	47	43·68	92·94	16	9	6	2	7	4	.....	1	1	1	.....	.....
Nova Scotia	8	215	243	458	397·01	86·68	147	74	95	40	47	20	22	12	1	.....	.....	.....
New Brunswick	9	185	187	372	303·51	81·59	118	56	64	42	42	24	17	9	.....	.....	.....	.....
Quebec	31	856	963	1,819	1,541·16	84·73	606	316	268	190	167	120	83	60	9	.....	.....	.....
Ontario	88	1,759	1,956	3,715	3,056·43	82·27	1,177	616	556	404	335	268	203	144	5	5	1	1
Manitoba	56	990	1,006	1,996	1,570·78	78·69	1,061	374	264	134	97	36	20	9	1	.....	.....	.....
Saskatchewan	33	510	499	1,009	829·24	82·18	412	174	160	121	58	59	22	3	.....	.....	.....	.....
Alberta	6	83	71	154	115·97	75·30	53	37	18	16	16	12	2	.....	.....	.....	.....	.....
Northwest Territories	8	131	141	272	207·51	76·29	181	15	24	13	17	10	6	3	3	.....	.....	.....
British Columbia	61	1,227	1,215	2,442	2,077·55	85·08	1,027	428	327	252	194	118	68	28	.....	.....	.....	.....
Yukon Territory	8	106	121	227	176·89	77·93	119	51	27	20	6	3	1	.....	.....	.....	.....	.....
Total—Day Schools	309	6,088	6,423	12,511	10,319·73	82·48	4,917	2,150	1,809	1,234	986	674	444	269	20	6	1	1

COMBINED SCHOOLS—WHITE AND INDIAN

Province	Number of Schools	Number on Roll			Average Attendance	Percentage of Attendance	Grades											
		Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Quebec	1	4	8	12	10·80	90·00	3	4	3	2	.....	.....	.....	.....	.....	.....	.....	.....
Ontario	3	35	37	72	67·40	93·61	18	8	14	5	8	7	9	3	.....	.....	.....	.....
Manitoba	1	13	7	20	15·88	79·40	8	3	3	3	.....	2	1	.....	.....	.....	.....	.....
Total—Combined White and Indian	5	52	52	104	94·08	90·46	29	15	20	10	8	9	10	3	.....	.....	.....	.....

Table No. 9—*Concluded*

SUMMARY OF SCHOOL STATEMENT

Province	Classes of Schools			Total Number of Schools	Number on Roll			Average Attendance	Percentage of Attendance	Grades											
	Day	Residential	Combined		Boys	Girls	Total			I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Prince Edward Island	1	.....	.....	1	26	21	47	43·68	92·94	16	9	6	2	7	4	.....	1	1	1	....	.....
Nova Scotia	8	1	.....	9	286	330	616	537·71	87·29	188	95	129	61	63	36	28	12	4	....	....	.....
New Brunswick	9	.....	.....	9	185	187	372	303·51	81·59	118	56	64	42	42	24	17	9	....	....	....	.....
Quebec	31	2	1	34	913	1,003	1,916	1,609·96	84·02	625	337	290	197	176	133	89	60	9	....	....	.....
Ontario	88	12	3	103	2,603	2,814	5,417	4,578·73	84·53	1,708	832	766	589	495	363	312	238	63	41	9	1
Manitoba	56	8	1	65	1,481	1,620	3,101	2,540·49	81·92	1,386	529	422	255	206	143	85	37	38	....	....	.....
Saskatchewan	33	12	.....	45	1,415	1,456	2,871	2,570·47	89·53	999	413	420	349	272	210	118	55	34	1	....	.....
Alberta	6	19	.....	25	1,066	1,201	2,267	1,858·96	82·00	707	391	334	272	253	171	82	46	11	....	....	.....
Northwest Territories	8	4	.....	12	239	279	518	422·85	81·63	295	61	52	40	36	20	6	3	5	....	....	.....
British Columbia	61	13	.....	74	2,265	2,320	4,585	4,072·04	88·81	1,552	822	619	540	421	279	191	95	54	11	1	.....
Yukon Territory	8	1	.....	9	129	144	273	220·25	80·68	131	63	29	29	11	6	3	1	....	....	....	.....
Totals	309	72	5	386	10,608	11,375	21,983	18,758·65	85·33	7,725	3,608	3,131	2,376	1,982	1,389	931	557	219	54	10	1

TABLE No. 10

Indian Children Attending Provincial and Private Schools—Secondary Grades

Provinces	Grades					University				Special	Totals
	IX	X	XI	XII	XIII	1st Year	2nd Year	3rd Year	4th Year		
Prince Edward Island	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Nova Scotia	2	1	1	1	.....	.....	.....	.....	.....	.....	5
New Brunswick	7	5	1	.....	.....	.....	.....	.....	.....	.....	13
Quebec	21	8	3	1	.....	.....	2	.....	1	23	59
Ontario	86	38	28	12	6	.....	.....	.....	.....	11	181
Manitoba	3	4	1	.....	.....	.....	.....	.....	.....	.....	8
Saskatchewan	5	4	.....	.....	.....	.....	.....	.....	.....	.....	9
Alberta	6	5	5	1	.....	.....	.....	.....	.....	3	20
British Columbia	26	24	13	8	.....	3	1	2	.....	4	81
Totals	156	90	52	23	6	3	3	2	1	41	377

Immigration Branch

A. L. Jolliffe, Director

The number of immigrants admitted to Canada during the fiscal year was 125,603, as compared to 79,194 in the fiscal year 1947-48, an increase of 58·6 per cent. Of these, 118,297 arrived from overseas and 7,306 from the United States. Their racial origins were: British 44,047 and French 1,901, the remaining 79,655, representing 47 other racial groups. Classified by nationality, 43,340 were British subjects; 6,591 were United States citizens; and 75,672 represented 40 other nationalities. Classified by sex, 52,953 were adult males, 44,821 were adult females, and 27,829 were children under 18 years of age. The adult male category was composed of 20,646 farmers, 13,060 skilled workers, 10,125 semi-skilled workers, 2,260 miners, 4,039 persons engaged in trading or merchandising, and 2,823 in various other occupations.

During the year 39,143,308 persons were examined at ocean and border ports. This is the largest number of examinations on record for any one year. Of these, 39,009,855 were admitted as non-immigrants, an increase of four per cent over the previous year; 125,603 were admitted as immigrants; and 7,850 were rejected. This is an increase of 1,564,146 in the total number of admissions over the previous fiscal year.

Arrivals, Admissions as Immigrants and Non-immigrants, and Rejections, by Districts

Districts	Arrivals	Admitted as immigrants	Admitted as non-immigrants	Rejected
Atlantic	9,990,071	105,946	9,882,947	1,178
Eastern	24,498,879	4,374	24,488,885	5,620
Western	2,411,640	932	2,410,541	167
Pacific	2,229,758	1,597	2,227,482	679
Through U.S. ocean ports	12,718	12,527	.....	191
Not otherwise specified	242	227	.....	15
TOTALS	39,143,308	125,603	39,009,855	7,850

Intended Destination of Immigrants, by Provinces

—	From overseas	From U.S.A.	Totals
Nova Scotia	2,384	389	2,773
New Brunswick	1,082	280	1,362
Prince Edward Island	222	60	282
Quebec	22,403	1,342	23,745
Ontario	59,126	3,413	62,539
Manitoba	7,724	197	7,921
Saskatchewan	5,185	187	5,372
Alberta	10,043	476	10,519
British Columbia	10,075	941	11,016
Yukon Territory	44	18	62
Northwest Territories	9	3	12
TOTALS	118,297	7,306	125,603

Tourist Movement

Out of the total of 39,009,855 persons who entered Canada during the year, it is estimated that approximately 25,090,021 were tourists. This is an increase of about 1,784,697 over the previous year.

The breakdown of tourists by Districts and from overseas is: Atlantic, 5,642,908; Eastern, 17,128,617; Western, 1,252,358; Pacific, 1,040,355; and from overseas, 25,783. The breakdown by method of entry is: highway and ferry, 23,472,258; train, 1,258,306; boat, 333,674; and from overseas, 25,783.

Students

During the year 6,428 students were admitted to Canada to attend school, college or university, as compared to 6,163 the previous year. Of this number 377 were British subjects, 4,423 United States citizens, 356 from Central and South America and 1,272 from 51 other countries.

Returning Canadians

During the year 4,580 Canadians who had taken up residence in other countries returned to live in Canada. This is a decrease from the previous year of 4,429. Figures for 1924 to 1934 appear on page 181 of the report for the year ended March 31, 1944. Figures for subsequent years are shown in the following table:—

—	Canadian Born	British Born Outside Canada	Canadian Naturalized	Totals
Fiscal year 1934-35	5,811	937	870	7,618
" 1935-36	4,854	418	542	5,814
" 1936-37	4,522	319	223	5,064
" 1937-38	4,524	356	329	5,209
" 1938-39	3,825	360	386	4,571
" 1939-40	3,687	505	369	4,561
" 1940-41	4,910	177	53	5,140
" 1941-42	3,123	143	52	3,318
" 1942-43	3,056	167	30	3,253
" 1943-44	2,090	93	19	2,202
" 1944-45	2,156	130	18	2,304
" 1945-46	2,653	207	35	2,895
" 1946-47	5,448	756	111	6,315
" 1947-48	6,406	2,297	306	9,009
" 1948-49	3,975	504	101	4,580
Total	61,040	7,369	3,444	71,853

Administration

The fiscal year 1948-49 has been marked by a continued increase in all phases of the work of the Branch. The over-all increase in staff was 177. The expanded movements of Netherlands farm families and of Displaced Persons have resulted in a large volume of investigational work. In one district alone, investigation officers travelled more than 350,000 miles in the course of their work. There has also been a marked increase in the inspectional work as evidenced by the 39,143,308 examinations carried out during the year, the largest number in the history of the Branch. The easing of the shipping situation which is apparent from the substantially larger number of arrivals at Atlantic and Pacific seaports as compared to last year, was also reflected in the greater number of ships' crews examined.

In spite of the retarding influence of the currency restrictions imposed by the United Kingdom Government, the full extent of which it is yet too early to assess, there was ample evidence of a continuing interest in migration to Canada. A somewhat similar situation obtained in other countries of Western Europe.

Field and Inspectional Service, Canada

Examination of Ships' Crews

The examination of ships' crews during the year was as follows:—

Districts	Ships	Crew members
Atlantic	4,325	249,728
Eastern	1,526	28,955
Western	347	10,539
Pacific	3,366	112,248
Total	9,564	401,740

Air Traffic

The number of air passengers was 236,730 as compared to 209,932 during the previous year. Arrivals by Districts were: Atlantic, 99,281; Eastern, 70,772; Western, 21,971; Pacific, 44,706.

Investigational Work

Investigations with regard to applications for permanent entry into Canada again increased. The importance of this phase of the activity of the Branch cannot be overstressed inasmuch as the successful settlement of immigrants depends in large measure on the sound judgment and thoroughness of investigating officers. The number of investigations in 1948-49 was 106,177, an increase of 24,857 over the previous year. Investigations by Districts were: Atlantic, 21,081; Eastern, 53,109; Western, 28,851; Pacific, 3,136.

Boards of Inquiry and Deportations

Officers of the Branch held 1,047 boards of inquiry in the following Districts: Atlantic, 318; Eastern, 517; Western, 72; Pacific, 140.

A total of 349 persons were deported during the year, 78 to the United States and 271 to other countries. The main causes for deportation were for becoming a public charge, entry by misrepresentation, conviction for a criminal offence, previous deportation, mental disability and infractions of the Opium and Narcotic Drugs Act.

Canada-U.S. Discussions

A number of questions relating to deportation problems common to Canada and the United States were the object of informal discussions between officials of the United States and Canadian Immigration Services. Other problems discussed included visa seekers from the United States, illegal entrants to and from Canada and the United States, hospital cases, border crossing cards and United States expatriation laws. Next year it is proposed to review existing agreements in respect of deportation proceedings and other immigration matters of mutual concern to the United States and Canada.

Settlement Service

In line with the view that constructive immigration exceeds the scope of a mere agency designed to fill temporary labour shortages in Canada with foreign immigrant labour, a Settlement Service was established within the framework of the Branch. The functions of this Service are to link settlement

opportunities in Canada for agriculturists, small industrialists, businessmen, scientists, and technicians to potential immigrants of this character. Heretofore no agency seemed to have been in a position to perform this necessary function.

As a beginning, the Service consists of a Superintendent of Settlement assisted by one Settlement Officer in each of the Provinces of British Columbia, Alberta, Saskatchewan, Manitoba, New Brunswick, Nova Scotia and Prince Edward Island, two in the Provinces of Ontario and Quebec, and three in the United Kingdom, located at London, Liverpool and Glasgow.

Settlement Officers in Canada will have the assistance of investigating officers and other members of the staffs of district headquarters and ports.

The value of the Settlement Service has already become apparent in connection with the placement of Netherlands agriculturists and in assisting a number of those who arrived earlier in establishing themselves on farms of their own. It has also been of great assistance in helping Netherlands agriculturists in obtaining suitable housing accommodation. Plans and specifications for three types of houses have been developed and made available to Netherlands farmers.

Naturalization

Approximately 10,000 applications for citizenship were referred to the Branch by the Registrar of Canadian Citizenship of the Department of the Secretary of State for confirmation of the legal landing of the applicants.

Air Facilitation

In co-operation with the International Civil Aviation Organization, representatives of the Branch participated in conferences held at Washington, Geneva and Bermuda, for the purpose of facilitating air traffic.

Polish Ex-Servicemen

Permanent landing was granted to 3,235 of the 4,527 Polish ex-servicemen admitted to Canada for agricultural employment during the fiscal year 1946-47.

Baltic Refugees from Sweden

During August and December, 522 displaced persons of Baltic origin, Estonians, Latvians, Lithuanians, with a few Finns and Poles arrived from Sweden in small boats, manned by members of their groups. With very few exceptions these people were without valid travelling documents. In view of the exceptional circumstances surrounding their departure from Sweden, and as they otherwise appeared to be desirable persons, their admission was authorized on humanitarian grounds. In an endeavour to discourage similar movements, steps have been taken to give publicity in Sweden to existing Canadian immigration facilities in that country, coupled with a warning that such unauthorized immigrants or refugees would in future be denied admission to Canada.

Entry of Newfoundland into Confederation

With the entry of Newfoundland into Confederation on March 31, 1949, citizens of Newfoundland became Canadian citizens as defined in the Immigration Act, and the provisions of the Act relating to domicile became applicable to residents of the new province. At the same time the provisions of the Act governing entry into Canada became applicable to persons applying for entry to Newfoundland.

On the administrative plane, in consultation with the Chief Commissioner of Customs and Immigration of Newfoundland, arrangements were made in regard to staff and operation of the ports of entry. The two main ports on the Island are Gander, with a staff of twenty officers and St. John's with a staff of four. Other ports of entry in Newfoundland are Argentia, Bell Island,

Botwood, Carbonear, Corner Brook, Fortune, Grand Bank, Harbour Grace, Harmon Field, Port au Basques, Port Union, St. Anthony and St. Lawrence, as well as Goose Bay in Labrador. This group of ports will be staffed by Customs Officers acting as part-time Immigration officers.

Creation of New Atlantic District

The entry of Newfoundland into Confederation made a redefinition of the boundaries of Immigration Districts necessary. A new district was established to include Newfoundland, Nova Scotia and Prince Edward Island. It was designated as the "Atlantic" District, with headquarters at Halifax. The redistribution of other districts in turn placed New Brunswick and Quebec in the jurisdiction of the Eastern District and Ontario east of longitude 87° in the jurisdiction of the newly-named "Central" District.

Immigration Facilities

Considerable progress was made in the improvement of immigration facilities at ports of entry and inland offices. At Halifax better dining-room and kitchen facilities were provided. At West Saint John, it is expected that new immigration quarters will be completed for the late summer of 1949. Work has progressed satisfactorily in regard to the erection of an administrative building to be occupied jointly by Immigration and Customs at Armstrong, P.Q. A similar building is under construction at Blackpool, P.Q. New inspectional offices have been occupied at Malton Airport, and at London, Ontario.

Legislation and Regulations

(1) Order in Council P.C. 1628, dated the 22nd day of April, 1948, granted authority for the admission to Canada of an additional 10,000 displaced persons.

(2) Order in Council P.C. 3015, dated the 8th day of July, 1948, amended the regulation respecting the production of passports established by Order in Council P.C. 4851, dated the 26th day of November, 1947, to provide for the acceptability of a travel document or affidavit establishing the identity of the holder thereof, in the case of a woman who has become a British subject by reason of marriage to a British subject domiciled in Canada, and in the case of an alien who is a refugee from his country of origin and who is unable to obtain a valid national passport. Non-immigrants of this class are required, however, to be in possession of a document establishing their admissibility to the country from which they are proceeding to Canada or to some other country.

(3) Order in Council P.C. 3371, dated the 28th day of July, 1948, amended previous Orders in Council relating to the admission of displaced persons, by extending their provisions to include citizens of Czechoslovakia who have fled from that country to Occupied Territory in Europe.

(4) By Order in Council P.C. 3396, dated the 3rd day of August, 1948, the provisions of Order in Council P.C. 4849, dated the 26th day of November, 1947, were waived in regard to 1,000 Catholic orphan children between the ages of five and sixteen years, with the proviso that the minimum age would not apply in the case of younger children accompanying brothers or sisters, and who can otherwise comply with the provisions of the Immigration Act and Regulations.

(5) Order in Council P.C. 4186, dated the 16th day of September, 1948, amended Order in Council P.C. 4849, dated the 26th day of November, 1947, to provide for the admission of citizens of France on the same basis as British subjects and citizens of the United States.

(6) By Order in Council P.C. 4232, dated the 22nd day of September, 1948, the provisions of Order in Council P.C. 4849, dated the 26th day of November, 1947, were waived in regard to an additional 210 Jewish orphan children under eighteen years of age.

(7) Order in Council P.C. 4462, dated the 5th day of October, 1948, amended Order in Council P.C. 4851, dated the 26th day of November, 1947, as amended, to provide for the admission of citizens of France, in respect of the production of passports, on the same basis as British subjects and citizens of the United States.

(8) Order in Council P.C. 3721, dated the 5th day of October, 1948, further amended Order in Council P.C. 2180, dated the 6th day of June, 1947, by providing for the admission of "displaced persons", wherever they might be located. Previously only "individuals from the displaced persons camp in Europe" were admissible. Order in Council P.C. 3721 also granted authority for the admission to Canada of an additional 10,000 displaced persons.

(9) Order in Council P.C. 5593, dated the 10th day of December, 1948, amended Order in Council P.C. 4849, dated the 26th day of November, 1947, by defining citizens of France as citizens of France "born in France".

(10) Order in Council P.C. 5594, dated the 10th day of December, 1948, amended Order in Council P.C. 4851, dated the 26th day of November, 1947, relating to the production of passports, by defining citizens of France as citizens of France born in France.

Field and Inspectional Service, Overseas

United Kingdom

Interest in migration to Canada remained at a high peak throughout the year, both in the United Kingdom and on the Continent. During the year, 155,354 letters and 35,376 telephone calls were received and 87,881 persons interviewed at the London office alone. The Superintendent of European Emigration for Canada at London is also responsible for the review of doubtful cases submitted by United Kingdom and Continental offices. A total of 2,774 such cases were reviewed during the year; 1,278 visas were granted and 1,027 were refused. Of a total of 384 applications to retain Canadian domicile, 171 were allowed and 213 denied. The London Office also granted 3,371 immigrant and non-immigrant visas to aliens.

On April 8, 1948, more stringent restrictions on the transfer of dollars to Canada were imposed by the British Government. Previously immigrants had been allowed to transfer the equivalent of £5,000 in yearly instalments of £1,250 over a period of four years. The new regulation reduced this to £1,000 in four yearly instalments of £250. The effect of the new regulation has been to divert some immigrants to countries in the sterling area and may account, in part, for a decrease of about ten per cent in the number of British immigrants admitted during the year.

To stimulate the flow of immigrants from the United Kingdom, an agreement was made with Cunard White Star Limited whereby the S.S. *Aquitania* was retained in the Canadian service in 1948 and priorities granted for the transportation of 12,100 immigrants. An agreement was also made with Trans-Canada Air Lines for the transportation of 10,000 immigrants before the close of the fiscal year 1948-49.

A new immigration office was opened at Glasgow at 18 Woodlands Terrace on May 1, 1948, and the Liverpool office, closed during the war, was re-opened at 34 Moorfields Street on January 17, 1949. Arrangements were also made for opening a new office at Belfast in the early part of the next fiscal year.

Continental Europe

The increase in the work of the Continental offices is reflected in the following figures:

Office	Visas granted				Visas refused	
	Immigrant		Non-Immigrant			
	1947-48	1948-49	1947-48	1948-49	1947-48	1948-49
Paris	963	1,442	1,805	2,389	516	928
Brussels	1,580	1,357	512	610	497	331
The Hague	4,377	6,380	685	1,037	712	812
Rome	520	7,306	34	208	35	651

The widening of immigration regulations in respect of citizens of France (see ***Legislation***) resulted in a large volume of inquiries at the Paris office and in a relatively larger volume of activity. But in France, as in Great Britain, restrictions with regard to the transfer of capital have a limiting effect on migration to Canada.

Netherlands Farm Families

The highly successful movement of agriculturists from the Netherlands, initiated the previous year, was continued, when approximately 7,000 Netherlanders were admitted to Canada. In close co-operation with the Netherlands authorities, the Branch has full responsibility for this movement. The Netherlands authorities reiterated their representations that this was not to be regarded as a group labour movement, but rather as a farm settlement scheme.

The movement continues to be handled under the nomination method. Under this plan, information concerning groups of 150 to 200 prospective immigrants who have been medically examined in the Netherlands are sent to the Branch by the Agricultural Attaché at the Royal Netherlands Embassy in Ottawa. Summaries containing salient facts pertaining to each immigrant are compiled and distributed to District Superintendents, Settlement Officers and interested organizations. Immigrants tentatively acceptable to farmers in Canada are then applied for and when settlement arrangements are found satisfactory following the usual investigation, advice is transmitted to the immigration office at The Hague, which grants the visas. The two railway companies advise Canadian farmers of the hour of arrival of the immigrants at their destination.

The distribution by provinces of the 6,057 agriculturists from the Netherlands admitted to Canada as part of the group movement was: Prince Edward Island, 16; Nova Scotia, 116; New Brunswick, 76; Quebec, 130; Ontario, 3,933; Manitoba, 314; Saskatchewan, 108; Alberta, 1,052; British Columbia, 312.

Displaced Persons

The movement of displaced persons continued to be a major project of the Branch and accounted for the greater part of the total increase in the number of immigrants admitted in 1948-49. The broadening of the definition of "displaced persons" by Order in Council P.C. 3721 (see ***Legislation***) widened the scope of selection. The majority of displaced persons admitted during the year

were part of the 40,000 whose entry was authorized by various Orders in Council. Group movements continued to be referred to the Immigration-Labour Committee for consideration and recommendation. From the inception of the movement up to March 31, 1949, the Immigration Labour Committee had recommended the following group movements: woodworkers, 3,622; miners, 3,700; railway workers, 2,530; steel workers, 375; aluminium workers, 76; foundry workers, 65; construction workers, 216; hydro construction workers, 2,700; clothing industry workers, 2,507; millinery workers, 200; textile workers, 589; shoe workers, 103; domestics, 11,000; nurses, 500; fur workers, 500; farm workers, 8,250; sugar beet workers, 675; heavy labourers, 500; carpenters, 50; cabinet makers, 112; community workers, 40; jewellery craftsmen, 15; stonemasons, 25; bricklayers, 25; plasterers, 25.

An interesting change in the pattern of the displaced persons movement has become discernible during the year. In the earlier stages the emphasis, in terms of numbers, was on bulk admissions. Now that heads of families or single wage earners have found a satisfactory level in the national economy, they are applying in increasing numbers for the admission of their close relatives who are admissible under the general immigration regulations. To March 31, 1949, applications had been received for the admission of 53,344 close relatives of displaced persons. Of these, 47,355 had been investigated and approved. To speed up the processing of close relatives, arrangements have been made under which prospective employers certify on the application forms submitted by displaced persons in Canada that suitable housing accommodation is available for their relatives upon arrival and that the employment of the applicant is to be continued for a period of at least twelve months at prevailing wage rates. Priority is given overseas in the presentation, examination and transportation of these dependants.

Admissions of Displaced Persons to Canada, By Occupational Groups, By Province of Destination, During the Fiscal Year, 1948-49

	N.S.	P.E.I.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	Totals
Blacksmiths	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	10
Building construction	3	.....	1	71	651	5	37	14	.....	.....	782
Cabinet makers	.....	.....	.....	30	34	.....	.....	.....	.....	.....	64
Domestics	140	19	96	4,310	1,267	523	1	.....	.....	.....	6,356
Domestic married couples	.....	.....	.....	145	33	.....	.....	.....	.....	.....	178
Farmers	29	55	20	438	1,773	333	64	340	11	.....	3,063
Family farm groups	8	10	.....	442	78	11	23	770	6	.....	1,348
Furriers	.....	.....	.....	433	.....	.....	.....	.....	.....	.....	433
Furrier's dependants	.....	.....	.....	414	.....	.....	.....	.....	.....	.....	414
Garment workers	.....	.....	.....	1,572	45	.....	.....	.....	.....	.....	1,617
Garment Worker's dependants	.....	.....	.....	1,320	52	.....	.....	.....	.....	.....	1,372
General labourers	.....	.....	.....	.....	242	.....	.....	.....	.....	.....	242
General labourers' dependants	.....	.....	.....	.....	219	.....	.....	.....	.....	.....	219
Hydro workers	.....	.....	.....	.....	1,773	.....	.....	.....	.....	.....	1,773
Miners	.....	.....	46	618	1,183	100	.....	14	.....	29	1,990
Nurses	.....	.....	3	22	13	.....	.....	.....	.....	.....	38
Railway workers	.....	.....	.....	.....	917	230	123	231	204	.....	1,705
Shoe workers	.....	.....	.....	1	98	.....	.....	.....	.....	.....	99
Special trades	12	.....	3	19	58	13	1	.....	.....	.....	106
Steel and foundry workers	.....	.....	.....	60	58	.....	.....	.....	.....	.....	118
Steel and foundry workers' dependants	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	4
Textile workers	.....	.....	.....	91	200	.....	.....	.....	.....	.....	291
Totals	192	84	169	9,986	8,708	1,215	249	1,369	221	29	22,222
Admissions of Jewish orphans (D.Ps.)											494
Admissions of D.Ps. destined to relatives											27,894
Grand Total											50,610

Admissions of Displaced Persons to Canada by Racial Origins, During the Fiscal Years 1947-48 and 1948-49

	1947-48	1948-49	Total
Albanian	....	17	17
Austrian	3	80	83
Bohemian	....	2	2
Bosnian	....	4	4
Bulgarian	4	43	47
Croatian	82	465	547
Czech	38	411	449
Danish	....	4	4
Dalmatian	....	5	5
Dutch	732	2,918	3,650
Esthonian	502	2,207	2,709
Finnish	2	24	26
French	2	7	9
German	233	3,989	4,222
Greek	5	11	16
Hebrew	2,181	6,298	8,479
Italian	....	24	24
Jugo-Slavian	198	1,382	1,580
Latvian	877	3,331	4,208
Lithuanian	1,978	4,362	6,340
Magyar	83	900	983
Montenegrin	....	3	3
Moravian	....	3	3
Norwegian	....	2	2
Polish	3,604	11,016	14,620
Roumanian	23	514	537
Russian	272	1,304	1,576
Ruthenian (Ukrainian)	3,321	10,277	13,598
Serbian	98	888	986
Slovakian	6	110	116
Spanish	....	1	1
Swedish	5	5	10
Swiss	....	2	2
Turkish	1	1	2
Total	14,250	50,610	64,860

Note.—The above figures embrace the total D.P. Movement to March 31, 1949.

Admissions of Displaced Persons to Canada, by Sex, During the Fiscal Year 1948-49

Adult males	21,300
Adult females	19,117
Children under 18 years of age	10,193
Total	50,610

Canadian Christian Council for the Resettlement of Refugees

The Council continued to assist in the processing and movement to Canada of displaced persons outside the mandate of I.R.O. Visas were granted to 5,616 individuals presented by C.C.C.R.R. to members of the Canadian Government Mission in Occupied Territory. The majority were close relatives of residents of Canada.

Immigrants from Malta

The movement to Canada of 500 Maltese, authorized last year, began in May, 1948, and was completed during the year. Many of those who came singly have found satisfactory settlement arrangements for their families and dependants. As a result, the number of persons admitted from Malta under this movement totalled 750.

Hong Kong Office

This office was re-opened on May 6, 1948, in the Union Building, Pedder Street, to deal with returning Canadian residents, wives and children of Canadian citizens of Chinese origin, visitors to Canada, and refugee problems in the Far East. The Superintendent of Canadian Immigration who is in charge of this office also issues passports and emergency certificates on behalf of the Department of External Affairs. During the year 320 visas were granted to Chinese immigrants, 45 to European immigrants, and 106 to non-immigrants. In addition, 1,241 Canadian residents of Chinese origin were examined and passed for return to Canada.

Salzburg, Austria

Plans were completed for the opening of an office of the Canadian Government Immigration Mission at Salzburg, on April 1, 1949, to deal with displaced persons and general immigration problems in that area.

Chinese Immigration

With the re-opening of an immigration office at Hong Kong, in April, 1948, facilities were made available for the movement to Canada of Chinese admissible under the regulations.

During the year, 442 applications were received from Chinese in Canada for the admission of 897 persons; 695 as immigrants and 202 as natural born Canadian citizens within the meaning of the Canadian Citizenship Act. Of this number, 115 were admitted as immigrants and 155 allowed entry as natural born Canadian citizens.

Table 1

Immigration to Canada from 1900 to 1949

		From Overseas			From U.S.A.				Grand Totals
		British Nationals	Others	Totals	U.S.A. Citizens	British Nationals	Others	Totals	
Six months ended June 30,	1900	5,141	10,211	15,352	.....	.....	.....	8,543	23,895
Fiscal year ended June 30,	1901	11,813	19,349	31,162	.....	.....	.....	17,987	49,149
" "	1902	17,270	23,721	40,991	.....	.....	.....	26,388	67,379
" "	1903	42,200	36,691	78,891	.....	.....	.....	49,473	128,364
" "	1904	51,050	34,110	85,160	12,648	4,145	23,946	40,739	125,899
" "	1905	65,967	36,756	102,723	15,477	2,263	22,190	39,930	142,653
" "	1906	88,174	43,094	131,268	33,013	2,108	17,675	52,796	184,064
Nine months ended Mar. 31,	1907	59,272	30,736	90,008	20,479	1,309	10,369	32,157	122,165
Fiscal year ended March 31,	1908	126,783	77,374	204,157	31,411	2,674	19,067	53,152	257,309
" "	1909	55,463	31,613	87,076	33,474	2,894	17,926	54,294	141,370
" "	1910	63,757	41,239	104,996	65,190	3,662	22,196	91,048	196,044
" "	1911	126,170	63,463	189,633	77,353	5,007	22,524	104,884	294,517
" "	1912	141,504	79,023	220,527	91,840	6,236	16,250	114,326	334,853
" "	1913	152,373	111,050	263,423	92,061	7,398	19,959	119,418	382,841
" "	1914	144,513	132,835	277,348	74,745	6,374	8,773	89,892	367,240
" "	1915	44,117	40,893	85,010	34,745	3,541	3,482	41,768	126,778
" "	1916	9,032	2,568	11,600	21,370	2,796	1,687	25,853	37,453
" "	1917	9,980	4,005	13,985	43,261	3,324	4,558	51,143	65,128
" "	1918	4,879	2,881	7,760	47,818	3,444	6,923	58,185	65,945
" "	1919	10,701	6,286	16,987	28,280	1,725	1,950	31,955	48,942
" "	1920	60,659	7,021	67,680	36,628	2,250	1,850	40,728	108,408
" "	1921	75,783	24,635	100,418	33,891	2,768	1,651	38,310	138,728
" "	1922	39,606	21,048	60,654	18,782	1,825	1,063	21,670	82,324
" "	1923	36,360	14,520	50,880	14,095	1,641	830	16,566	67,446
" "	1924	78,740	49,299	128,039	14,928	1,478	805	17,211	145,250
" "	1925	54,943	40,601	95,544	13,171	1,794	853	15,818	111,362
" "	1926	37,569	39,717	77,286	15,442	2,251	1,085	18,778	96,064
" "	1927	50,378	72,586	122,964	17,820	2,239	966	21,025	143,989
" "	1928	51,552	75,041	126,593	21,260	2,696	1,051	25,007	151,600
" "	1929	59,497	77,666	137,163	26,539	3,061	960	30,560	167,723
" "	1930	64,962	67,599	132,561	26,751	3,121	855	30,727	163,288
" "	1931	28,144	35,799	63,943	20,723	2,938	619	24,280	88,223
" "	1932	7,332	4,123	11,455	12,277	1,815	205	14,297	25,752
" "	1933	3,283	3,303	6,586	11,172	1,806	218	13,196	19,782
" "	1934	2,454	3,709	6,163	6,545	1,032	163	7,740	13,903
" "	1935	2,408	3,768	6,176	5,104	769	87	5,960	12,136
" "	1936	2,264	3,718	5,982	4,322	709	90	5,121	11,103
" "	1937	2,521	4,389	6,910	4,301	742	70	5,113	12,023
" "	1938	3,351	6,651	10,002	4,727	852	64	5,643	15,645
" "	1939	3,831	7,634	11,465	4,685	917	61	5,663	17,128
" "	1940	3,962	6,495	10,457	4,383	1,234	131	5,748	16,205
" "	1941	3,428	625	4,053	5,295	2,064	84	7,443	11,496
" "	1942	2,353	201	2,554	5,075	1,180	56	6,311	8,865
" "	1943	2,524	94	2,618	3,457	1,344	26	4,827	7,445
" "	1944	4,519	80	4,599	3,302	1,101	38	4,441	9,040
" "	1945	10,564	118	10,682	3,687	907	30	4,624	15,306
" "	1946	21,463	2,164	23,627	6,051	1,354	49	7,454	31,081
" "	1947	54,036	1,544	55,580	9,546	1,771	93	11,410	66,990
" "	1948	47,009	23,151	70,160	8,027	820	187	9,034	79,194
" "	1949	42,830	75,467	118,297	6,519	510	277	7,306	125,603

Table 2

Immigration to Canada for the Period July 1, 1900, to March 31, 1910

	Fiscal Years										Totals
	1900–1	1901–2	1902–3	1903–4	1904–5	1905–6	Nine Months Ended March 31, 1907	1907–8	1908–9	1909–10	
English	9,331	12,783	32,087	36,003	48,847	65,135	41,156	90,380	37,019	40,416	413,157
Irish	933	1,311	2,236	3,128	3,998	5,018	3,404	6,547	3,609	3,940	34,124
Scottish	1,476	2,853	7,046	10,552	11,744	15,846	10,729	22,223	11,810	14,706	108,985
Welsh	70	312	423	691	770	797	502	1,032	463	728	5,788
Totals	11,810	17,259	41,792	50,374	65,359	86,796	55,791	120,182	52,901	59,790	562,054
African, South	.....	.....	.....	21	35	46	23	76	53	97	351
Arabian	98	70	46	58	48	19	31	50	4	14	438
Armenian	62	112	113	81	78	82	208	563	79	75	1,453
Australian	3	11	46	58	204	322	185	180	171	203	1,383
Austro-Hungarian	5,692	8,557	13,095	11,137	10,089	10,170	4,045	21,376	10,798	9,757	104,716
Brazilian	.....	.....	.....	2	1	2	5	1	4	.....	15
Bulgarian	.....	1	7	14	2	71	179	2,529	56	557	3,416
Chinese	7	2	.....	.....	.....	18	92	1,884	1,887	2,156	6,046
Doukhobor	.....	12	.....	.....	24	204	.....	.....	.....	.....	240
Dutch	25	35	223	169	281	389	394	1,212	495	741	3,964
East Indian	.....	.....	.....	.....	45	387	2,124	2,623	6	10	5,195
Egyptian	1	3	1	3	2	18	10	8	2	2	50
Finnish	682	1,292	1,734	845	1,323	1,103	1,049	1,212	669	1,457	11,366
French and Belgian	492	654	1,240	2,392	2,539	2,754	1,964	3,885	2,658	2,637	21,215
German	984	1,048	1,887	2,985	2,759	1,796	1,903	2,377	1,340	1,533	18,612
Greek	81	161	193	191	98	254	545	1,053	192	452	3,220
Hebrew	2,765	1,015	2,066	3,727	7,715	7,127	6,584	7,712	1,636	3,182	43,529
Italian	4,710	3,828	3,371	4,445	3,473	7,959	5,114	11,212	4,228	7,118	55,458
Japanese	6	.....	.....	.....	354	1,922	2,042	7,601	495	271	12,691
Malay	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	5
Maltese	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	2
Mennonite	.....	52	38	11	.....	.....	.....	.....	.....	.....	101
Negro	.....	.....	.....	.....	5	42	108	136	73	7	371
Newfoundland	.....	.....	335	519	190	340	1,029	3,374	2,108	3,372	11,267
New Zealand	.....	.....	2	23	57	89	30	70	65	82	418
Persian	.....	1	40	5	8	7	31	7	1	5	105
Polish	162	230	274	669	745	725	1,033	1,593	376	1,407	7,214
Portuguese	.....	.....	.....	.....	1	6	2	2	2	2	15
Roumanian	152	551	438	619	270	396	431	949	278	293	4,377
Russian	1,044	2,467	5,505	1,955	1,887	3,152	1,927	6,281	3,547	4,564	32,329
Scandinavian	1,750	2,451	5,448	4,203	4,118	3,859	2,296	4,073	2,082	3,782	34,062
Serbian	23	.....	2	10	7	19	4	48	31	76	220
Spanish	14	1	7	5	10	12	29	61	32	42	213
Swiss	30	17	73	128	150	172	112	195	129	211	1,217
Syrian	464	1,066	847	369	630	336	277	732	189	195	5,105
Turkish	37	17	43	29	30	357	232	489	236	517	1,987
U.S.A. citizens, via ocean ports	68	73	.....	58	109	123	89	133	94	186	933
West Indian	.....	.....	23	55	77	194	90	278	159	203	1,079
Total, Continental, etc.	19,352	23,732	37,099	34,786	37,364	44,472	34,217	83,975	34,175	45,206	394,378
From the United States	17,987	26,388	49,473	40,739	39,930	52,796	32,157	53,152	54,294	91,048	457,964
Total immigration	49,149	67,379	128,364	125,899	142,653	184,064	122,165	257,309	141,370	196,044	1,414,396

Table 3

Immigration to Canada for the Period April 1, 1910, to March 31, 1920

	Fiscal Years										Totals
	1910–11	1911–12	1912–13	1913–14	1914–15	1915–16	1916–17	1917–18	1918–19	1919–20	
English	84,707	95,107	108,082	102,122	30,807	5,857	5,174	2,477	7,954	45,173	487,460
Irish	6,877	8,327	9,706	9,585	3,525	818	958	174	336	2,751	43,057
Scottish	29,924	32,988	30,735	29,128	8,346	1,887	2,062	473	1,518	10,997	148,058
Welsh	1,505	1,699	2,019	1,787	598	102	88	54	106	682	8,640
Totals	123,013	138,121	150,542	142,622	43,276	8,664	8,282	3,178	9,914	59,603	687,215
African, South	86	144	22	56	23	11	1	4	.....	23	370
Albanian	.....	.....	.....	3	4	.....	.....	.....	.....	.....	7
Arabian	3	2	10	16	.....	.....	.....	.....	.....	.....	31
Argentinian	.....	.....	.....	2	5	.....	.....	.....	.....	2	9
Armenian	20	60	100	139	36	.....	3	2	.....	10	370
Australian	266	184	106	106	51	32	18	34	35	88	920
Austro-Hungarian	16,285	21,651	21,875	28,323	7,150	15	1	.....	2	8	95,310
Belgian	1,563	1,601	1,826	2,651	1,149	172	126	19	48	1,532	10,687
Brazilian	13	.....	.....	5	.....	2	.....	.....	.....	.....	20
Bulgarian	1,068	3,295	4,616	1,727	4,048	1	.....	.....	.....	1	14,756
Chinese	5,278	6,247	7,445	5,512	1,258	88	393	769	4,333	544	31,867
Cuban	.....	.....	.....	10	1	1	3	1	.....	2	18
Doukhobor	41	24	108	4	.....	.....	.....	.....	.....	.....	177
Dutch	931	1,077	1,524	1,506	605	186	151	94	59	154	6,287
East Indian	5	3	5	88	.....	1	.....	.....	.....	.....	102
Egyptian	3	.....	7	5	.....	.....	.....	.....	.....	.....	15
Finnish	2,132	1,646	2,391	3,183	459	139	249	113	2	44	10,358
French	2,041	2,094	2,755	2,683	1,206	180	199	114	222	1,584	13,078
German	2,533	4,664	4,953	5,537	2,472	27	9	1	1	12	20,209
Greek	777	693	1,390	1,102	1,147	145	258	45	4	39	5,600
Hebrew	5,146	5,322	7,387	11,252	3,107	65	136	32	22	116	32,595
Italian	8,359	7,590	16,601	24,722	6,228	388	758	189	49	1,165	66,049
Japanese	437	765	724	856	592	401	648	883	1,178	711	7,195
Macedonian	.....	.....	.....	17	132	.....	.....	.....	.....	.....	149
Maltese	.....	.....	128	402	19	4	109	144	2	405	1,213
Mexican	.....	3	9	9	.....	.....	.....	1	3	.....	25
Montenegrin	.....	.....	36	13	9	.....	1	.....	.....	.....	59
Negro	12	138	211	266	202	34	98	35	22	61	1,079
Newfoundland	2,229	2,598	1,036	496	338	255	1,243	1,199	512	443	10,349
New Zealand	116	61	39	24	21	18	12	13	15	31	350
Persian	19	19	20	19	7	3	.....	2	2	.....	91
Polish	2,177	5,060	9,945	9,793	1,976	8	12	.....	4	76	29,051
Portuguese	13	6	9	58	8	.....	1	1	.....	3	99
Roumanian	511	793	1,116	1,504	361	4	4	.....	.....	21	4,314
Russian	6,621	9,805	18,623	24,485	5,201	40	25	42	42	51	64,935
Scandinavian—											
Danish	535	628	798	871	326	167	145	74	44	233	3,821
Icelandic	250	205	231	292	145	15	9	3	12	11	1,173
Norwegian	2,169	1,692	1,832	1,647	788	232	303	235	91	179	9,168
Swedish	3,213	2,394	2,477	2,435	916	177	332	156	101	241	12,442
Serbian	50	209	366	193	220	6	1	.....	1	12	1,058
Spanish	197	191	296	1,138	755	11	76	28	12	15	2,719
Swiss	270	230	246	269	209	42	30	12	11	100	1,419
Syrian	124	144	232	278	79	3	9	2	.....	18	889
Turkish	469	632	770	187	33	.....	5	.....	.....	1	2,097
U.S.A. citizens, via ocean ports	203	143	121	121	41	15	20	28	21	55	768
West Indian	455	393	495	719	389	47	315	307	223	66	3,409
Others	.....	.....	.....	2	18	1	.....	.....	.....	20	41
Total, Continental, etc.	66,620	82,406	112,881	134,726	41,734	2,936	5,703	4,582	7,073	8,077	466,738
From the United States	104,884	114,326	119,418	89,892	41,768	25,853	51,143	58,185	31,955	40,728	678,152
Total immigration	294,517	334,853	382,841	367,240	126,778	37,453	65,128	65,945	48,942	108,408	1,832,105

Table 4

Immigration to Canada for the Period April 1, 1920, to March 31, 1925

	Fiscal Years					Totals
	1920-21	1921-22	1922-23	1923-24	1924-25	
English	47,687	23,225	19,188	37,030	26,466	153,596
Irish	6,384	3,572	3,668	9,719	9,379	32,722
Scottish	19,248	11,596	11,071	25,057	16,174	83,146
Welsh	943	627	581	1,113	1,159	4,423
Totals	74,262	39,020	34,508	72,919	53,178	273,887
African, South	63	32	41	60	87	283
Albanian	6	6	1	7	2	22
Arabian	3	5	2	.....	.....	15
Argentinian	4	.....	4	.....	.....	8
Armenian	85	70	59	486	304	1,004
Australian	90	76	67	112	162	507
Austrian	26	14	23	82	75	220
Belgian	1,645	503	316	1,662	1,300	5,426
Bermudian	8	2	7	4	4	25
Brazilian	.....	.....	.....	.....	1	1
Bulgarian	4	27	19	267	69	386
Chilean	.....	.....	.....	.....	3	3
Chinese	2,435	1,746	711	674	.....	5,566
Cuban	.....	.....	.....	1	.....	1
Czecho-slovakian	308	152	101	2,757	2,084	5,402
Dutch	595	183	119	1,149	1,637	3,683
East Indian	10	13	21	40	46	130
Egyptian	9	2	.....	3	3	17
Esthonian	.....	.....	12	51	49	112
Finnish	1,401	274	1,171	7,640	4,261	14,747
French	861	332	281	370	326	2,170
German	137	178	216	1,769	2,215	4,515
Greek	357	209	177	292	237	1,272
Hebrew	2,763	8,404	2,793	4,255	4,459	22,674
Hungarian	23	48	23	364	1,052	1,510
Italian	3,880	2,413	2,074	6,379	2,349	17,095
Jamaican	18	13	30	24	8	93
Japanese	532	471	369	448	501	2,321
Jugo-slavian	89	180	136	1,306	1,620	3,331
Latvian	.....	.....	1	11	20	32
Lettish	.....	.....	.....	6	2	8
Lithuanian	.....	19	106	236	125	486
Luxemburg	16	5	3	85	35	144
Maltese	140	34	57	148	26	405
Mexican	1	.....	.....	1	.....	2
Negro	144	42	42	42	39	309
Newfoundland	1,042	367	1,552	5,346	1,288	9,595
New Zealand	40	25	33	50	107	255
Persian	1	9	1	5	18	34
Polish	4,061	2,707	2,921	4,211	2,734	16,634
Portuguese	4	.....	2	.....	3	9
Roumanian	969	759	427	1,431	2,056	5,642
Russian	1,077	321	222	3,058	5,411	10,089
Scandinavian—						
Danish	511	541	382	1,355	1,830	4,619
Icelandic	50	31	21	27	49	178
Norwegian	429	480	507	2,424	2,550	6,390
Swedish	715	442	948	3,536	2,138	7,779
Spanish	202	6	15	39	3	265
Swiss	235	187	152	1,585	680	2,839
Syrian	443	123	91	286	210	1,153
Turkish	8	3	3	27	29	70
Ukrainian	491	89	36	832	26	1,474
U.S.A. citizens, via ocean ports	110	67	32	134	96	439
Venezuelan	.....	.....	1	6	.....	7
West Indian	110	24	44	37	37	252
Total, Continental, etc.	26,156	21,634	16,372	55,120	42,366	161,648
From the United States	38,310	21,670	16,566	17,211	15,818	109,575
Total immigration	138,728	82,324	67,446	145,250	111,362	545,110

Table

Statement of Immigration to Canada, by Origins, From Overseas and

Racial Origin	1925-26			1926-27			1927-28			1928-29		
	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals
English	19,689	5,923	25,612	24,890	6,045	30,935	25,991	7,291	33,282	30,355	9,181	39,536
Irish	5,993	2,125	8,118	9,187	2,366	11,553	8,756	2,966	11,722	9,199	3,767	12,966
Scottish	10,295	2,139	12,434	14,296	2,432	16,728	14,341	2,856	17,197	16,137	3,453	19,590
Welsh	1,053	210	1,263	1,411	226	1,637	1,784	289	2,073	3,189	300	3,489
Totals	37,030	10,397	47,427	49,784	11,069	60,853	50,872	13,402	64,274	58,880	16,701	75,581
Belgian	1,063	78	1,141	2,080	69	2,149	2,171	78	2,249	1,222	79	1,301
Danish	1,112	299	1,411	2,030	225	2,255	3,835	284	4,119	3,311	351	3,662
Dutch	1,180	541	1,721	1,674	568	2,242	1,928	537	2,465	1,599	741	2,340
Finnish	1,617	63	1,680	5,180	88	5,268	4,765	112	4,877	3,651	100	3,751
French	498	1,821	2,319	548	2,499	3,047	868	3,138	4,006	745	3,934	4,679
German	7,356	2,318	9,674	12,540	2,681	15,221	12,032	3,190	15,222	12,806	3,803	16,609
Icelandic	53	22	75	30	32	62	28	18	46	24	23	47
Norwegian	1,072	800	1,872	3,384	1,255	4,639	4,327	1,330	5,657	2,434	1,419	3,853
Swedish	1,335	620	1,955	2,628	693	3,321	3,134	757	3,891	3,297	874	4,171
Swiss	320	98	418	568	101	669	614	134	748	490	156	646
Totals	15,606	6,660	22,266	30,662	8,211	38,873	33,702	9,578	43,280	29,579	11,480	41,059
Albanian	14	.....	14	17	.....	17	30	3	33	28	7	35
Arabian	10	.....	10	4	.....	4	6	1	7	1	1	2
Armenian	85	17	102	65	13	78	44	9	53	17	10	27
Austrian	75	79	154	401	129	530	606	153	759	409	100	509
Bohemian	8	63	71	22	85	107	7	67	74	8	86	94
Bulgarian	47	4	51	126	2	128	249	2	251	282	2	284
Chinese	.....	.....	.....	.....	.....	.....	3	.....	3	1	.....	1
Croatian	1,006	2	1,008	1,085	2	1,087	902	5	907	990	24	1,014
Czech	805	33	838	721	7	728	714	13	727	846	5	851
Dalmatian	1	.....	1	.....	.....	.....	.....	.....	.....	1	.....	1
East Indian	62	1	63	60	2	62	56	.....	56	52	1	53
Esthonian	28	2	30	92	.....	92	110	2	112	92	.....	92
Greek	217	41	258	340	45	385	583	72	655	736	70	806
Hebrew	3,587	427	4,014	4,471	392	4,863	4,296	470	4,766	3,301	547	3,848
Herzegovinian	.....	.....	.....	3	.....	3	4	.....	4	.....	.....	.....
Italian	1,638	138	1,776	3,301	165	3,466	3,593	190	3,783	792	272	1,064
Japanese	421	.....	421	475	.....	475	478	.....	478	445	1	446
Jugo-Slavian	1,604	23	1,627	2,084	18	2,102	1,450	19	1,469	2,824	32	2,856
Korean	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....
Lettish	24	3	27	60	4	64	77	8	85	74	3	77
Lithuanian	165	23	188	842	6	848	1,037	15	1,052	1,608	18	1,626
Magyar	4,112	75	4,187	4,863	77	4,940	5,318	103	5,421	6,242	106	6,348
Maltese	21	.....	21	33	1	34	39	1	40	18	1	19
Mexican	.....	4	4	1	2	3	.....	1	1	.....	.....	.....
Montenegrin	.....	.....	.....	5	.....	5	.....	.....	.....	.....	.....	.....
Moravian	6	.....	6	36	.....	36	33	2	35	4	1	5
Negro	53	269	322	51	241	292	88	237	325	96	280	376
North American Indian	.....	7	7	.....	13	13	.....	28	28	.....	23	23
Persian	11	.....	11	6	.....	6	4	.....	4	1	.....	5
Polish	2,535	190	2,725	6,505	199	6,704	6,733	254	6,987	8,269	246	8,512
Portuguese	3	3	6	14	4	18	7	4	11	12	10	22
Roumanian	265	26	291	292	38	330	237	38	275	284	48	333
Russian	925	167	1,092	1,127	169	1,296	948	184	1,132	908	285	1,190
Ruthenian	4,259	58	4,317	9,995	66	10,061	10,128	61	10,189	15,571	39	15,610
Serbian	454	4	458	885	8	893	411	15	426	390	20	413
Slovak	2,046	23	2,069	4,274	10	4,284	3,714	20	3,734	4,303	40	4,347
Spanish	12	17	29	29	20	49	28	17	45	18	49	61
Spanish American	.....	.....	.....	6	2	8	.....	.....	.....	3	4	7
Syrian	134	22	156	218	23	241	82	31	113	75	44	119
Turkish	17	.....	17	8	2	10	4	2	6	3	4	7
Totals	24,650	1,721	26,371	42,518	1,745	44,263	42,019	2,027	44,046	48,704	2,379	51,083
Grand totals	77,286	18,778	96,064	122,964	21,025	143,989	126,593	25,007	151,600	137,163	30,560	167,723

5

from the United States, for the period April 1, 1925, to March 31, 1935

1929-30			1930-31			1931-32			1932-33			1933-34			1934-35		
From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals
32,278	9,379	41,657	14,662	7,498	22,160	4,275	4,525	8,800	1,940	4,153	6,093	1,375	2,623	3,998	1,386	2,053	3,433
10,159	3,762	13,921	4,233	2,904	7,137	791	1,716	2,507	323	1,512	1,835	283	905	1,188	291	727	1,018
18,640	3,638	22,278	7,872	2,917	10,789	1,843	1,732	3,575	764	1,747	2,511	547	1,038	1,585	472	734	1,206
3,005	332	3,337	817	231	1,048	179	147	326	70	92	162	55	77	132	55	55	110
64,082	17,111	81,193	27,584	13,550	41,134	7,088	8,120	15,208	3,097	7,504	10,601	2,260	4,643	6,903	2,198	3,569	5,767
696	92	788	255	105	360	47	31	78	37	42	79	41	23	64	61	18	79
2,685	319	3,004	820	184	1,004	53	87	140	55	53	108	43	47	90	21	28	49
1,755	703	2,458	344	444	788	33	236	269	33	226	259	27	137	164	44	104	148
4,565	82	4,647	2,297	57	2,354	92	38	130	30	29	59	51	16	67	59	21	80
697	4,419	5,116	347	4,391	4,738	87	2,734	2,821	88	2,702	2,790	74	1,130	1,204	86	809	895
14,281	3,733	18,014	7,724	2,673	10,397	727	1,532	2,259	518	1,180	1,698	401	755	1,156	301	656	957
6	28	34	25	17	42	.....	10	10	1	6	7	.....	10	10	1	12	13
2,256	1,149	3,405	740	645	1,385	70	171	241	44	218	262	31	108	139	37	93	130
2,918	736	3,654	730	366	1,096	79	195	274	17	165	182	19	110	129	10	83	93
473	117	590	211	83	294	24	28	52	17	41	58	19	30	49	22	21	43
30,332	11,378	41,710	13,493	8,965	22,458	1,212	5,062	6,274	840	4,662	5,502	706	2,366	3,072	642	1,845	2,487
26	1	27	25	1	26	5	.....	5	.....	.....	.....	1	.....	1	3	.....	3
7	2	9	2	.....	2	.....	.....	.....	2	.....	2	.....	.....	.....	1	.....	1
14	16	30	21	1	22	4	1	5	1	4	5	7	3	10	1	4	5
437	75	512	116	68	184	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20	81	101	11	57	68	.....	21	21	7	16	23	.....	10	10	.....	9	9
296	10	306	295	.....	295	15	3	18	3	5	8	12	2	14	5	.....	5
.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	2	.....	2	.....	.....	.....
771	11	782	482	2	484	106	5	111	96	4	100	108	6	114	155	.....	155
434	14	448	225	8	233	69	9	78	65	7	72	52	7	59	77	4	81
7	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
58	.....	58	80	.....	80	47	.....	47	62	1	63	33	.....	33	33	.....	33
117	2	119	63	2	65	6	1	7	.....	1	1	2	2	4	2	.....	2
634	48	682	388	48	436	20	43	63	37	32	69	34	26	60	35	17	52
3,544	620	4,164	2,908	513	3,421	202	447	649	346	426	772	599	344	943	335	289	624
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,277	236	1,513	1,007	228	1,235	414	166	580	255	142	397	267	109	376	325	56	381
194	.....	194	204	1	205	195	.....	195	115	.....	115	104	1	105	93	.....	93
921	35	956	364	27	391	57	9	66	56	11	67	63	3	66	120	2	122
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
70	8	78	28	1	29	4	2	6	.....	4	4	4	.....	4	.....	.....	.....
964	22	986	466	11	477	45	5	50	57	6	63	37	2	39	37	5	42
5,688	99	5,787	2,401	71	2,472	397	41	438	364	20	384	509	18	527	362	20	382
40	1	41	13	6	19	5	.....	5	2	4	6	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	2	2	3	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	.....	23	2	.....	2	.....	1	1	3	.....	3	.....	.....	.....	.....	.....	.....
195	251	446	120	158	278	15	83	98	9	60	69	19	57	76	5	16	21
.....	22	22	.....	8	8	.....	34	34	.....	20	20	.....	8	8	.....	6	6
1	.....	1	2	.....	2	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....
6,610	227	6,837	3,997	226	4,223	554	103	657	360	99	459	374	50	424	406	40	446
13	11	24	5	10	15	2	2	4	1	6	7	2	4	6	2	3	5
383	62	445	179	44	223	22	15	37	26	11	37	27	7	34	52	5	57
765	173	938	879	97	976	74	32	106	62	35	97	61	16	77	60	25	85
11,291	41	11,332	6,413	78	6,491	502	38	540	414	47	461	421	8	429	586	15	601
375	29	404	140	18	158	31	16	47	26	18	44	37	10	47	26	3	29
2,879	46	2,925	1,957	32	1,989	337	9	346	252	8	260	395	6	401	595	12	607
26	37	63	8	26	34	9	11	20	7	16	23	7	6	13	7	7	14
.....	4	4	1	1	2	2	.....	2	.....	1	1	4	.....	4	.....	.....	.....
61	51	112	54	22	76	15	16	31	19	26	45	14	26	40	13	7	20
6	1	7	7	.....	7	1	1	2	.....	.....	.....	2	.....	2	.....	1	1
38,147	2,238	40,385	22,866	1,765	24,631	3,155	1,115	4,270	2,649	1,030	3,679	3,197	731	3,928	3,336	546	3,882
132,561	30,727	163,288	63,943	24,280	88,223	11,455	14,297	25,752	6,586	13,196	19,782	6,163	7,740	13,903	6,176	5,960	12,136

Table

Immigration to Canada, by Origins, from Overseas and from the

Racial Origin	1935-36			1936-37			1937-38			1938-39			1939-40		
	From Over-Seas	From U.S.A.	Totals	From Over-Seas	From U.S.A.	Totals	From Over-seas	From U.S.A.	Totals	From Over-seas	From U.S.A.	Totals	From Over-seas	From U.S.A.	Totals
English	1,286	1,744	3,030	1,445	1,738	3,183	1,949	1,870	3,819	2,247	1,824	4,071	2,489	1,878	4,367
Irish	249	626	875	262	617	879	364	686	1,050	387	726	1,113	375	710	1,085
Scottish	484	677	1,161	519	639	1,158	604	737	1,341	665	707	1,372	643	702	1,345
Welsh	30	56	86	38	69	107	55	48	103	74	60	134	59	75	134
Totals	2,049	3,103	5,152	2,264	3,063	5,327	2,972	3,341	6,313	3,373	3,317	6,690	3,566	3,365	6,931
Belgian	72	9	81	93	13	106	123	22	145	187	15	202	100	23	123
Danish	21	33	54	22	44	66	40	43	83	49	34	83	71	39	110
Dutch	111	97	208	90	102	192	119	113	232	237	139	376	264	147	411
Finnish	43	24	67	49	16	65	79	14	93	58	14	72	57	20	77
French	95	724	819	135	711	846	134	774	908	138	860	998	152	794	946
German	209	471	680	367	529	896	523	571	1,094	586	507	1,093	1,021	510	1,531
Icelandic	6	6	12	.....	2	2	3	5	8	.....	8	8	.....	4	4
Norwegian	31	94	125	25	74	99	27	91	118	21	84	105	40	89	129
Swedish	26	89	115	16	73	89	47	95	142	15	90	105	13	80	93
Swiss	32	18	50	49	16	65	87	18	105	75	22	97	49	32	81
Totals	646	1,565	2,211	846	1,580	2,426	1,182	1,746	2,928	1,366	1,773	3,139	1,767	1,738	3,505
Albanian	1	.....	1	4	.....	4	8	1	9	10	.....	10	4	.....	4
Arabian	.....	2	2	.....	.....	.....	4	.....	4	4	2	6	.....	.....	.....
Armenian	4	1	5	3	1	4	4	3	7	5	1	6	2	1	3
Bohemian	1	6	7	1	13	14	5	6	11	2	10	12	332	9	341
Bulgarian	22	2	24	18	1	19	28	2	30	29	.....	29	15	.....	15
Chinese	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Croatian	157	.....	157	240	.....	240	277	4	281	265	3	268	106	2	108
Czech	106	1	107	134	4	138	188	3	191	169	4	173	290	3	293
Dalmatian	.....	.....	.....	1	.....	1	.....	.....	.....	1	.....	1	.....	.....	.....
East Indian	20	1	21	13	.....	13	14	.....	14	14	.....	14	11	.....	11
Esthonian	2	.....	2	5	.....	5	2	1	3	12	.....	12	3	1	4
Greek	53	19	72	75	20	95	115	11	126	127	10	137	115	10	125
Hebrew	655	225	880	391	228	619	317	267	584	621	269	890	1,321	302	1,623
Italian	341	49	390	299	58	357	408	69	477	365	58	423	186	64	250
Japanese	83	.....	83	103	.....	103	139	.....	139	46	.....	46	36	.....	36
Jugo-Slavian	106	3	109	106	3	109	116	9	125	250	3	253	55	6	61
Lettish	3	.....	3	2	3	5	11	.....	11	4	.....	4	3	2	5
Lithuanian	22	3	25	42	10	52	37	6	43	39	6	45	49	5	54
Magyar	314	22	336	328	11	339	622	24	646	532	22	554	329	37	366
Maltese	.....	.....	.....	4	1	5	2	.....	2	1	5	6	.....	.....	.....
Mexican	.....	1	1	6	.....	6	1	.....	1	2	.....	2	.....	.....	.....
Montenegrin	.....	.....	.....	.....	.....	.....	2	.....	2	8	.....	8	.....	.....	.....
Moravian	.....	.....	.....	.....	.....	.....	3	.....	3	9	.....	9	52	.....	52
Negro	3	20	23	5	17	22	9	17	26	7	24	31	7	22	29
North American Indian	.....	2	2	.....	2	2	.....	11	11	.....	13	13	.....	4	4
Persian	.....	.....	.....	1	.....	1	2	1	3	.....	.....	.....	1	.....	1
Polish	362	42	404	432	35	467	615	46	661	586	68	654	297	51	348
Portuguese	4	3	7	2	.....	2	1	2	3	1	2	3	1	3	4
Roumanian	33	4	37	65	2	67	77	11	88	102	2	104	20	8	28
Russian	84	13	97	79	19	98	120	22	142	134	14	148	134	47	181
Ruthenian	418	8	426	855	15	870	1,356	13	1,369	1,837	19	1,856	1,509	16	1,525
Serbian	29	.....	29	35	3	38	83	4	87	70	5	75	17	4	21
Slovak	432	11	443	520	7	527	1,249	13	1,262	1,450	19	1,469	206	22	228
Spanish	6	5	11	10	11	21	14	2	16	6	4	10	9	10	19
Spanish American	.....	.....	.....	.....	1	1	3	.....	3	.....	.....	.....	.....	1	1
Syrian	26	10	36	19	5	24	15	8	23	18	10	28	14	15	29
Turkish	.....	.....	.....	1	.....	1	1	.....	1	.....	.....	.....	.....	.....	.....
Totals	3,287	453	3,740	3,800	470	4,270	5,848	556	6,404	6,726	573	7,299	5,124	645	5,769
Grand Totals	5,982	5,121	11,103	6,910	5,113	12,023	10,002	5,643	15,645	11,465	5,663	17,128	10,457	5,748	16,205

6

United States, for the Period April 1, 1935, to March 31, 1945

1940-41			1941-42			1942-43			1943-44			1944-45		
From Over-seas	From U.S.A.	Totals	From Over-seas	From U.S.A.	Totals	From Over-seas	From U.S.A.	Totals	From Over-seas	From U.S.A.	Totals	From Over-seas	From U.S.A.	Totals
														..
2,408	2,841	5,249	1,852	2,234	4,086	1,992	1,703	3,695	3,470	1,491	4,961	8,178	1,574	9,752
235	953	1,188	122	926	1,048	170	592	762	352	610	962	652	540	1,192
406	1,013	1,419	179	888	1,067	230	718	948	411	580	991	989	549	1,538
55	91	146	29	88	117	26	62	88	45	43	88	124	48	172
3,104	4,898	8,002	2,182	4,136	6,318	2,418	3,075	5,493	4,278	2,724	7,002	9,943	2,711	12,654
30	20	50	10	17	27	.....	11	11	6	9	15	13	8	21
22	63	85	4	42	46	3	22	25	9	28	37	12	36	48
51	187	238	11	192	203	10	136	146	8	123	131	28	131	159
2	30	32	1	18	19	.....	22	22	.....	15	15	2	10	12
129	849	978	104	632	736	69	580	649	149	586	735	305	653	958
39	359	398	23	371	394	15	256	271	11	302	313	55	312	367
.....	4	4	.....	5	5	1	4	5	1	4	5	1	6	7
21	79	100	14	96	110	19	84	103	12	51	63	13	55	68
6	117	123	1	72	73	6	53	59	3	53	56	6	91	97
12	42	54	15	36	51	3	18	21	4	10	14	9	13	22
312	1,750	2,062	183	1,481	1,664	126	1,186	1,312	203	1,181	1,384	444	1,315	1,759
.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	3	5	.....	.....	.....	1	4	5	.....	2	2	1	2	3
3	12	15	.....	11	11	.....	6	6	.....	7	7	1	3	4
1	1	2	.....	.....	.....	.....	.....	.....	.....	2	2	.....	2	2
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	6	13	.....	3	3	1	2	3	2	3	5	.....	1	1
49	18	67	17	10	27	6	2	8	8	4	12	18	9	27
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6	.....	6	3	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	.....	1	1	.....	1	1	.....	1	2	.....	2	2	.....	2
26	20	46	3	27	30	1	14	15	1	11	12	3	15	18
284	342	626	111	277	388	31	239	270	56	182	238	93	237	330
43	85	128	1	66	67	.....	43	43	3	81	84	26	51	77
44	1	45	1	.....	1	.....	1	1	.....	.....	.....	.....	.....	.....
1	6	7	.....	5	5	.....	3	3	.....	6	6	1	10	11
1	6	7	.....	2	2	1	2	3	1	.....	1	1	1	2
6	8	14	.....	4	4	1	4	5	4	5	9	3	7	10
35	21	56	4	29	33	.....	27	27	3	26	29	19	24	43
.....	4	4	1	.....	1	.....	1	1	1	.....	1	1	.....	1
.....	.....	.....	.....	2	2	.....	1	1	1	.....	1	1	.....	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	2	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....
45	30	75	13	31	44	5	53	58	5	24	29	23	42	65
.....	16	16	.....	15	15	.....	6	6	.....	16	16	2	21	23
.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....
25	100	125	5	102	107	5	71	76	7	63	70	43	76	119
4	2	6	5	4	9	3	2	5	3	.....	3	6	2	8
6	4	10	2	5	7	.....	3	3	3	8	11	2	4	6
9	31	40	11	35	46	6	22	28	4	19	23	9	42	51
3	19	22	.....	19	19	.....	15	15	.....	30	30	14	17	31
7	5	12	.....	9	9	.....	5	5	.....	4	4	1	3	4
5	23	28	2	20	22	4	19	23	1	21	22	.....	7	7
19	14	33	5	7	12	2	5	7	8	2	10	12	3	15
2	2	4	2	4	6	5	2	7	2	1	3	6	4	10
1	16	17	2	7	9	.....	13	13	1	19	20	7	15	22
.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....
637	795	1,432	189	694	883	74	566	640	118	536	654	295	598	893
4,053	7,443	11,496	2,554	6,311	8,865	2,618	4,827	7,445	4,599	4,441	9,040	10,682	4,624	15,306

Table 7

Immigration to Canada, by Origins, from Overseas and from the United States for the Period April 1, 1945, to March 31, 1949

Racial Origin	1945-46			1946-47			1947-48			1948-49		
	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals	From Overseas	From U.S.A.	Totals
English	15,781	2,416	18,197	35,596	3,767	39,363	31,209	2,939	34,148	25,870	2,208	28,078
Irish	1,410	936	2,346	3,073	1,441	4,514	3,460	1,028	4,488	3,853	916	4,769
Scottish	2,642	934	3,576	8,166	1,556	9,722	9,107	1,016	10,123	9,522	829	10,351
Welsh	329	102	431	1,141	103	1,244	1,012	93	1,105	770	79	849
Totals	20,162	4,388	24,550	47,976	6,867	54,843	44,788	5,076	49,864	40,015	4,032	44,047
Belgian	33	28	61	766	31	797	1,034	9	1,043	969	36	1,005
Danish	34	57	91	83	80	163	286	74	360	681	67	748
Dutch	97	235	332	2,365	298	2,663	4,264	286	4,550	9,866	247	10,113
Finnish	6	20	26	31	50	81	66	27	93	243	30	273
French	571	936	1,507	1,615	1,420	3,035	630	959	1,589	1,113	788	1,901
German	234	580	814	338	861	1,199	530	842	1,372	4,785	639	5,424
Icelandic	3	12	15	14	7	21	8	4	12	3	7	10
Norwegian	125	124	249	235	176	411	219	134	353	364	109	473
Swedish	27	110	137	88	154	242	81	172	253	149	90	239
Swiss	18	37	55	70	40	110	222	32	254	277	29	306
Totals	1,148	2,139	3,287	5,605	3,117	8,722	7,340	2,539	9,879	18,450	2,042	20,492

Albanian					4	4	5		5	19	6	25
Arabian							1	1	2	13	2	15
Armenian	3	3	6	13	1	14	5	2	7	10	1	11
Bohemian	10	10	20	11	17	28	14	15	29	17	6	23
Bosnian										5		5
Bulgarian		1	1	1	3	4	13	3	16	70		70
Chinese	1		1	7		7	24	1	25	111	3	114
Corsican				1		1						
Croatian	1	2	3	5	6	11	84	9	93	494	4	498
Czech	43	12	55	176	20	196	285	24	309	1,144	35	1,179
Dalmatian				1		1	2		2	6		6
East Indian	1		1	7	1	8	130	37	167	63	1	64
Esthonian	8	1	9	9	1	10	572	5	577	2,531	2	2,533
Greek	32	23	55	60	49	109	840	50	890	699	67	766
Hebrew	1,345	368	1,713	605	600	1,205	3,922	532	4,454	8,447	510	8,957
Italian	58	125	183	142	159	301	204	170	374	5,207	158	5,365
Japanese				1	2	3		3	3	8		8
Jugo-Slavian	10	18	28	17	19	36	220	28	248	1,453	28	1,481
Lettish	1		1	8	2	10	897	2	899	3,445		3,445
Lithuanian	4	5	9	23	12	35	1,992	19	2,011	4,444	15	4,459
Magyar	38	49	87	64	74	138	191	61	252	1,351	37	1,388
Maltese	5	1	6	16		16	27	11	38	750	1	751
Mexican	3	2	5	2		2	2	1	3	4	3	7
Montenegrin										3		3
Moravian		3	3	1		1	10		10	9		9
Negro	75	52	127	110	43	153	85	111	196	135	75	210
North American Indian		20	20	11	26	37	1	19	20		26	26
Persian	1		1	4	1	5	2		2	2		2
Polish	528	95	623	336	163	499	4,269	117	4,386	15,420	119	15,539
Portuguese	12	4	16	34	10	44	27	11	38	55	2	57
Roumanian	5	15	20	21	26	47	45	20	65	573	9	582
Russian	59	53	112	145	64	209	389	53	442	1,457	38	1,495
Ruthenian	18	30	48	103	49	152	3,386	40	3,426	10,498	30	10,528
Serbian	1	4	5	5	14	19	111	6	117	896	8	904
Slovakian	4	13	17	5	15	20	193	24	217	384	16	400
Spanish	28	3	31	37	6	43	27	3	30	38	4	42
Spanish American	5	3	8	7	12	19	28	19	47	33	14	47
Syrian	14	11	25	9	26	35	27	22	49	36	12	48
Turkish	4	1	5	2	1	3	2		2	2		2
Totals	2,317	927	3,244	1,999	1,426	3,425	18,032	1,419	19,451	59,832	1,232	61,064
GRAND TOTALS	23,627	7,454	31,081	55,580	11,410	66,990	70,160	9,034	79,194	118,297	7,306	125,603

Table

Immigration from Overseas Showing Country of Birth

Country of Birth	Totals	Albanian	Arabian	Armenian	Belgian	Bosnian	Bohemian	English	Irish	Scottish	Welsh	Bulgarian	Chinese	Croatian	Czech	Dalmatian	Dutch	East Indian	Esthonian	Finnish	French	German
Africa (British)	97							59	7	15							6				1	
Africa (Not British)	89		3		1			17	1	5					1						18	1
Australia	417							295	40	54	2		1				5		1		2	3
Austria	1,095		1			1	1	10		1		1		19	38		21		5			241
Belgium	1,046				928			5									12				61	
Bermuda	33							16		1												
Bulgaria	75											60			1							
Canada	97				4			17	4	5			1				3			1	13	1
Central America	12							5		1												
China	240							62	5	11			104		2		1				2	6
Czecho-Slovakia	2,267						16							5	1,010		5					232
Denmark	678																1		1			2
Eire	1,507							45	1,434	18	1				1						1	
England	23,089		1		5			21,101	320	543	138		1		16		17		3		38	35
Esthonia	2,397																1		2,277	61		8
Finland	190																1		8	169		
France	1,052				21			27	1	3				1	5		5				799	7
Germany	3,676	1			1			22	2	6		1		6	14		176		56		8	523
Greece	659							1				1										
Holland	6,813				5			6	1								6,774		1		2	5
Hungary	1,817							1						7	5		1					294
India	440		1		1			254	32	75							1	60			3	
Ireland (Northern)	1,636							76	1,510	40	7											1
Italy	5,167							4							1						1	6
Japan	15							6		1											1	
Jugo-Slavia	3,633	1				4		1				2		452	10	6	3				1	823
Latvia	3,258														1		1		18			23
Lesser British Isles	88							64	1	2											20	
Lithuania	4,131													1			1		3			100
Malta	744							17			1											
Mexico	22							6									2					1
Newfoundland	3,058							2,681	282	39	1										51	
New Zealand	230							165	13	42							1				4	
Norway	332							1														
Palestine	55		1					3	1												1	1
Poland	28,972	1						3							9		136		6		3	1,412
Portugal	13							6														
Roumania	1,775				2			1				3		1	4		2				4	511
Russia	5,595							10		1		2			15		2,642		99	9	1	436
St. Pierre and Miquelon	34							2													31	
Scotland	9,109							259	142	8,563	15						2				3	1
South America	175							62	2	15	2				2		11				1	10
Spain	35							6		1											1	1
Sweden	204							2									2		52	1		4
Switzerland	343							3		1					2						10	60
Syria	37		7	2																		
Ukraine	96																8					
United States	265				1			94	25	32	3			2	6		3			1	4	10
Wales	906							250	13	17	600						1		1		2	1
West Indies (British)	323							143	11	22								2			5	1
West Indies (Not British)	46							9	3								3				12	
Others	214	16	1	6				53	3	8			4		1		18	1		1	9	25
Totals	118,297	19	13	10	969	5	17	25,870	3,853	9,522	770	70	111	494	1,144	6	9,866	63	2,531	243	1,113	4,785

8

by Racial Origin, for the Fiscal Year ended March 31, 1949

Greek	Hebrew	Italian	Japanese	Jugo-Slavian	ettish	Lithuanian	Magyar	Maltese	Mexican	Montenegrin	Moravian	Negro	Persian	Polish	Portuguese	Roumanian	Russian	Ruthenian	Danish	Icelandic	Norwegian	Swedish	erbian	Slovak	Spanish	Spanish American	Swiss	Syrian	Turkish
1	3	.....	..	1	1	.....	.....	.....	..	..	..	.....	..	2	..	.....	.....	.....	.....	..	.....	1	.....	.....	.....	.....	.....	.....	..
7	8	4	..	.....	.....	1	.....	15	..	..	..	.....	..	3	..	.....	1	.....	.....	..	1	.....	.....	1	.....	.....	.....	1	..
.....	4	.....	..	.....	.....	1	.....	.....	..	..	..	.....	..	3	..	1	.....	.....	3	..	.....	2	.....	.....	.....	.....	.....	.....	..
.....	248	1	..	45	5	9	25	.....	..	..	1	.....	..	85	..	7	22	300	.....	..	.....	.....	3	5	.....	.....	.....	.....	..
.....	25	5	..	.....	.....	.....	.....	.....	..	..	..	.....	..	7	..	.....	1	2	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	.....	.....	..	.....	.....	.....	.....	1	..	..	..	7	..	.....	8	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	.....	.....	..	1	1	.....	.....	.....	..	..	..	.....	..	1	..	..	11	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	1	23	1	.....	.....	1	.....	.....	..	..	..	.....	..	9	..	1	.....	1	3	..	4	2	.....	.....	1	.....	.....	1	..
.....	.....	.....	..	.....	.....	.....	.....	.....	..	..	..	1	..	.....	..	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	5	.....	.....	..
.....	10	.....	..	.....	1	.....	2	.....	..	..	..	.....	..	3	2	.....	27	.....	.....	..	.....	.....	.....	.....	2	.....	.....	.....	..
.....	415	2	..	39	3	.....	74	.....	..	..	6	.....	..	22	..	1	9	84	.....	..	.....	.....	1	343	.....	.....	.....	.....	..
.....	8	.....	..	.....	2	1	.....	.....	..	..	..	.....	..	7	..	1	2	3	647	..	2	1	.....	.....	.....	.....	.....	.....	..
.....	3	1	..	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	..	.....	1	.....	.....	..	.....	.....	.....	.....	.....	.....	2	.....	..
.....	601	34	..	1	1	15	3	2	..	..	1	1	..	133	6	3	21	9	10	..	11	3	.....	1	2	.....	13	.....	..
.....	1	.....	..	.....	24	5	.....	.....	..	..	..	.....	..	3	..	.....	10	4	.....	..	.....	3	.....	.....	.....	.....	.....	.....	..
.....	.....	1	..	.....	1	1	1	.....	..	..	..	.....	..	2	..	.....	2	.....	.....	..	.....	4	.....	.....	.....	.....	.....	.....	..
1	55	15	..	1	.....	.....	3	.....	..	..	..	.....	..	64	..	2	9	23	1	..	.....	.....	1	3	1	4	.....	.....	..
.....	750	10	..	14	145	283	17	.....	..	..	..	1	..	762	..	14	56	783	7	..	1	.....	15	1	.....	1	.....	.....	..
652	1	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	..	.....	.....	1	.....	..	.....	.....	1	.....	1	.....	.....	.....	1
.....	16	.....	..	.....	.....	.....	1	.....	..	..	..	.....	..	1	..	.....	.....	1	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	345	.....	..	11	.....	.....	1,134	.....	..	..	..	.....	..	9	..	3	2	2	.....	..	.....	.....	2	1	.....	.....	.....	.....	..
2	3	2	..	.....	1	.....	.....	1	..	..	..	.....	..	1	..	.....	.....	.....	.....	..	1	1	.....	.....	1	.....	.....	.....	..
.....	1	1	..	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	..	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	56	5,060	..	1	.....	.....	3	.....	..	..	..	.....	..	18	..	.....	3	3	.....	..	.....	.....	10	1	.....	.....	.....	.....	..
.....	.....	.....	7	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	..	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
1	29	3	..	1,310	.....	.....	49	.....	..	3	..	.....	..	5	..	4	33	16	.....	..	.....	.....	857	20	.....	.....	.....	.....	..
.....	21	1	..	.....	3,058	87	.....	.....	..	..	..	.....	..	18	..	.....	22	6	.....	..	.....	2	.....	.....	.....	.....	.....	.....	..
.....	.....	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	1	..	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	86	.....	..	2	20	3,892	.....	.....	..	..	..	.....	..	12	..	1	9	4	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	.....	1	..	.....	.....	.....	.....	725	..	..	..	.....	..	.....	..	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	1	.....	..	.....	.....	.....	.....	.....	3	..	..	.....	..	2	..	.....	.....	.....	.....	..	.....	.....	.....	.....	7	.....	.....	.....	..
.....	1	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	..	.....	.....	.....	1	..	.....	1	.....	.....	.....	.....	.....	1	..
.....	1	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	1	..	.....	.....	.....	2	..	1	.....	.....	.....	.....	.....	.....	.....	..
.....	.....	.....	..	.....	.....	1	.....	.....	..	..	..	.....	..	.....	..	.....	.....	.....	.....	..	329	.....	.....	1	.....	.....	.....	.....	..
.....	27	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	18	..	.....	.....	3	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	4,815	1	..	16	14	22	2	.....	..	..	1	.....	..	13,881	..	16	142	8,487	.....	..	.....	.....	1	3	.....	.....	1	.....	..
.....	.....	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	7	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	550	1	..	2	.....	.....	34	.....	..	..	..	.....	..	17	..	502	11	128	.....	..	.....	.....	2	.....	.....	.....	.....	.....	..
5	266	1	..	4	158	102	.....	.....	..	..	..	.....	..	228	..	13	1,042	553	.....	..	2	1	1	4	.....	.....	.....	.....	..
.....	.....	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	..	.....	.....	.....	.....	..	.....	.....	.....	.....	1	.....	.....	.....	..
.....	37	22	..	.....	.....	8	.....	.....	..	..	..	.....	..	46	..	.....	4	.....	.....	..	6	1	.....	.....	.....	.....	.....	.....	..
.....	12	5	..	2	.....	4	.....	.....	..	..	..	10	..	3	17	.....	5	.....	1	..	.....	.....	1	.....	.....	8	1	1	..
.....	1	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	.....	..	.....	.....	.....	.....	..	.....	.....	.....	.....	25	.....	.....	.....	..
.....	7	.....	..	.....	6	1	1	.....	..	..	..	.....	..	3	..	.....	.....	.....	1	..	.....	124	.....	.....	.....	.....	.....	.....	..
.....	8	2	..	.....	1	.....	.....	.....	..	..	..	.....	..	1	..	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	255	.....	..
.....	.....	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	1	..	.....	.....	.....	.....	..	.....	.....	.....	.....	.....	.....	.....	27	..
.....	1	.....	..	.....	1	.....	.....	.....	..	..	..	.....	..	7	..	.....	6	73	.....	..	.....	.....	.....	.....	.....	.....	.....	.....	..
1	1	10	..	2	2	10	1	4	1	..	..	.....	..	32	..	3	.....	8	2	..	3	.....	2	2	.....	.....	.....	.....	..
1	10	.....	..	.....	.....	.....	.....	.....	..	..	..	.....	..	5	..	.....	.....	.....	.....	..	3	2	.....	.....	.....	.....	.....	.....	..
.....	5	.....	..	.....	.....	.....	.....	.....	..	..	..	109	..	.....	14	.....	.....	.....	1	..	.....	.....	.....	.....	2	6	.....	2	..
.....	5	1	..	.....	.....	.....	1	.....	..	..	..	6	..	.....	..	1	.....	.....	.....	..	.....	.....	.....	.....	.....	5	.....	.....	..
28	9	.....	..	1	.....	.....	.....	2	..	..	..	.....	2	4	1	.....	6	4	2	3	.....	1	.....	.....	1	.....	.....	3	1
699	8,447	5,207	8	1,453	3,445	4,444	1,351	750	4	3	9	135	2	15,420	55	573	1,457	10,498	681	3	364	149	896	384	38	33	277	36	2

Table

Immigration from the United States Showing Country of Birth

Country of Birth	Totals	Albanian	Arabian	Armenian	Belgian	Bohemian	English	Irish	Scottish	Welsh	Chinese	Croatian	Czech	Dutch	East Indian	Esthonian	Finnish	French	German	Greek	Hebrew
Africa (British)	17	..	..	..	..	..	10	1	1	..	..	..	..	1	..	..	..	3	1	..	..
Africa (Not British)	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Australia	20	..	..	..	..	..	13	2	3	..	..	..	..	..	..	..	..	..	..	..	1
Austria	33	..	..	..	..	..	1	..	..	..	..	..	3	..	..	..	..	..	10	..	10
Belgium	20	..	..	..	16	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	3
Canada	877	..	..	..	..	..	281	121	167	8	..	..	1	19	..	..	1	165	46	..	33
Central America	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
China	10	..	..	..	..	..	2	1	..	..	2	..	..	..	..	..	3	1	..	..	..
Czecho-Slovakia	24	..	..	..	..	..	..	..	..	..	..	..	13	..	..	..	..	..	1	..	4
Denmark	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Eire	27	..	..	..	..	..	..	27	..	..	..	..	..	..	..	..	..	..	..	..	..
England	320	..	..	..	..	..	288	3	3	1	..	..	..	..	..	..	..	2	2	..	18
Esthonia	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..
Finland	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	..	..	..	..
France	40	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	36	1	1	3
Germany	38	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	19	..	18
Greece	40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	40	..
Holland	27	..	..	..	1	..	1	..	..	..	..	..	..	21	..	..	..	..	2	..	2
Hungary	27	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	3	..	8
India	7	..	..	..	..	..	5	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Ireland (Northern)	31	..	..	..	..	..	1	29	1	..	..	..	..	..	..	..	..	..	..	..	..
Italy	37	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Jugo-Slavia	19	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	2	..	1
Latvia	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Lesser British Isles	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lithuania	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
Newfoundland	17	..	..	..	..	..	10	5	2	..	..	..	..	..	..	..	..	..	..	..	..
New Zealand	11	..	..	..	..	..	7	1	3	..	..	..	..	..	..	..	..	..	..	..	..
Norway	11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Palestine	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Poland	98	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	2	..	60
Roumania	11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	5
Russia	45	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	4	..	26
Scotland	150	..	..	..	..	..	5	5	137	..	..	..	..	..	..	..	..	..	..	..	2
South America	11	..	..	..	..	..	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Spain	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sweden	11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
Switzerland	6	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	2	..	..
Syria	2	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
United States	5,236	6	1	..	19	6	1,563	718	509	59	1	3	17	203	1	..	12	584	540	21	308
Wales	16	..	..	..	..	..	5	..	..	11	..	..	..	..	..	..	..	..	..	..	..
West Indies (British)	8	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Others	15	..	..	1	..	..	1	3	1	..	..	..	..	1	..	..	..	..	1	4	1
Totals	7,306	6	2	1	36	6	2,208	916	829	79	3	4	35	247	1	2	30	788	639	67	510

9

by Racial Origin, for the Fiscal Year ended March 31, 1949

Italian	Jugo-Slavian	Lithuanian	Magyar	Maltese	Mexican	Negro	North American Indian	Polish	Portuguese	Roumanian	Russian	Ruthenian	Danish	Icelandic	Norwegian	Swedish	Serbian	Slovak	Spanish	Spanish American	Swiss	Syrian
																1						
	1										2	5						1				
6					1	4	1	4		1	1	2	2	2	3	2					4	2
						1														1		
																1						
	2																	4				
													12									
											1		1		1							
												1			1	1						
1																						
	1		14																			
36																						
	8									2							4	1				
		5																				
															11							
								29				6										
										3												
											12	2										
1																						
																				2		
																			1			
																10						
																					2	
																						1
113	16	10	23	1	2	66	25	86	1	3	22	14	52	5	92	75	4	10	3	10	23	9
						4			1											1		
1															1							
158	28	15	37	1	3	75	26	119	2	9	38	30	67	7	109	90	8	16	4	14	29	12

Table

Origin, Sex, Occupation and Destination of Immigrant Arrivals

Racial Origin	Sex				Totals	Trade or								
	18 Years and Over		Under 18 Years			Farming Class			Unskilled and semi-skilled Workers			Skilled Workers		
	Males	Females	Males	Females		Males	Females	Children	Males	Females	Children	Males	Females	Children
Albanian	15	3	1	.....	19	7	.....	.....	7	.....	.....	1	.....	.....
Arabian	4	5	1	3	13	2	1	4	1	.....	.....	.....	.....	.....
Armenian	5	5	.....	.....	10	.....	.....	.....	.....	1	.....	.....	.....	.....
Belgian	358	298	153	160	969	286	184	274	15	12	1	27	26	15
Bohemian	10	4	3	.....	17	.....	1	.....	.....	1	.....	3	2	3
Bosnian	2	1	2	.....	5	1	1	2	1	.....	.....	.....	.....	.....
British—														
English	9,832	9,804	3,164	3,070	25,870	1,244	600	645	1,879	1,279	662	4,141	1,914	1,544
Irish	1,992	1,210	331	320	3,853	448	49	55	533	230	76	599	183	128
Scottish	3,546	3,685	1,150	1,141	9,522	356	147	152	655	541	290	1,775	621	492
Welsh	317	311	80	62	770	47	21	14	79	58	21	117	55	35
Bulgarian	26	37	3	4	70	10	3	1	7	4	2	2	3	1
Chinese	11	79	11	10	111	.....	.....	.....	1	1	.....	.....	2	.....
Croatian	276	159	32	27	494	130	27	24	106	8	6	27	14	8
Czech	438	513	96	97	1,144	154	98	86	99	53	13	91	38	25
Dalmatian	6	.....	.....	.....	6	.....	.....	.....	6	.....	.....	.....	.....	.....
Dutch	2,983	2,837	2,190	1,856	9,866	2,700	1,763	3,447	57	243	199	110	77	54
East Indian	17	27	16	3	63	.....	.....	.....	7	.....	1	3	.....	.....
Esthonian	880	1,187	256	208	2,531	243	117	84	297	104	85	235	191	116
Finnish	76	117	29	21	243	21	9	6	29	20	13	15	18	8
French	447	387	131	148	1,113	109	45	51	71	41	17	125	63	72
German	1,393	2,025	663	704	4,785	1,103	907	951	35	203	139	156	144	79
Greek	251	274	109	65	699	73	17	28	59	34	14	37	23	11
Hebrew	3,379	2,818	1,177	1,073	8,447	304	185	163	203	158	118	2,331	1,739	1,277
Italian	3,014	1,358	446	389	5,207	1,348	184	254	877	259	231	631	133	119
Japanese	4	3	.....	1	8	1	.....	.....	1	.....	.....	.....	.....	.....
Jugo-Slavian	773	529	78	73	1,453	441	130	67	266	23	16	43	39	20
Lettish	1,285	1,530	306	324	3,445	357	140	139	545	85	54	136	140	44
Lithuanian	1,770	1,847	400	427	4,444	603	251	278	549	83	25	214	144	94
Magyar	532	598	102	119	1,351	275	111	90	108	31	15	89	60	49
Maltese	486	97	86	81	750	7	.....	2	184	1	1	264	9	4
Mexican	.....	2	.....	2	4	.....	.....	.....	.....	.....	.....	1	.....	.....
Montenegrin	3	.....	.....	.....	3	3	.....	.....	.....	.....	.....	.....	.....	.....
Moravian	4	4	1	.....	9	2	.....	.....	.....	.....	.....	.....	1	.....
Negro	46	57	14	18	135	2	1	1	13	3	2	19	11	2
Persian	1	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Polish	8,719	4,705	1,014	982	15,420	5,887	997	949	1,306	207	117	482	305	163
Portuguese	30	17	4	4	55	2	1	.....	4	1	4	5	3	.....
Roumanian	196	256	57	64	573	120	88	73	21	18	9	35	31	18
Russian	523	586	185	163	1,457	300	170	197	135	35	25	45	53	22
Ruthenian	5,147	3,545	925	881	10,498	2,772	1,089	901	1,313	160	105	441	328	200
Scandinavian—														
Danish	378	165	69	69	681	296	63	91	18	19	7	37	15	8
Icelandic	.....	2	.....	1	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norwegian	156	126	40	42	364	49	13	21	23	19	6	65	30	35
Swedish	62	60	19	8	149	28	13	11	14	8	3	14	8	8
Serbian	665	167	30	34	896	405	45	20	219	17	13	18	6	2
Slovak	101	221	30	32	384	65	32	25	11	12	6	14	10	5
Spanish	14	16	5	3	38	2	1	.....	4	2	3	3	5	3
Spanish American	9	19	1	4	33	1	.....	.....	1	4	1	2	1	2
Swiss	129	82	37	29	277	84	26	44	14	7	3	14	9	4
Syrian	5	27	2	2	36	.....	.....	.....	.....	3	.....	.....	1	.....
Turkish	1	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	50,317	41,807	13,449	12,724	118,297	20,288	7,530	9,150	9,773	3,988	2,304	12,366	6,455	4,670

10

from Overseas, for the fiscal Year ended March 31, 1949

Occupation											Destination										
Trading and Clerical Classes			Mining Class			Female Domestic Servants		Other Classes			Nova Scotia	New Brunswick	Prince Edward Island	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories
Males	Females	Children	Males	Females	Children	18 yrs. and over	Under 18 yrs.	Males	Females	Children											
....	....	....	....	..	..	3	....	....	....	1	....	....	....	3	9	....	1	6	....	....	....
....	1	....	....	..	..	....	....	1	3	....	1	....	....	3	1	....	....	8	....	....	....
2	2	....	....	..	..	....	....	3	2	....	....	....	....	3	7	....	....	....	....	....	....
13	11	5	1	..	..	7	1	16	58	17	3	10	....	137	564	66	18	123	48	....	....
2	....	....	....	..	..	....	....	5	....	....	....	....	....	3	14	....	....	....	....	....	....
....	....	....	....	..	..	....	....	....	....	....	....	....	....	....	5	....	....	....	....	....	....
1,755	2,070	735	75	24	19	346	47	738	3,571	2,582	1,122	389	59	2,475	14,872	845	583	1,399	4,119	4	3
261	243	56	10	..	..	90	5	141	415	331	135	53	4	433	2,548	95	85	149	351	....	....
488	721	193	44	11	14	222	3	228	1,422	1,147	171	105	9	785	6,353	328	181	400	1,189	....	1
40	60	5	8	3	7	6	....	26	108	60	18	20	2	63	434	38	13	78	103	....	1
....	2	....	2	..	..	10	....	5	15	3	....	....	....	9	47	2	2	6	4	....	....
3	1	....	....	..	..	....	....	7	75	21	4	1	2	4	18	6	5	12	59	....	....
3	1	1	5	..	..	76	....	5	33	20	3	4	....	117	236	51	13	45	25	....	....
51	37	16	4	..	..	76	....	39	211	53	8	5	....	245	593	56	54	84	97	....	2
....	....	....	....	..	..	....	....	....	....	....	....	....	....	....	4	....	....	1	1	....	....
50	67	52	7	1	..	275	23	59	411	271	123	94	25	333	4,617	1,332	683	1,534	1,123	2	....
1	....	....	....	..	..	....	....	6	27	18	....	....	....	1	3	....	....	....	59	....	....
14	26	12	69	..	..	563	3	22	186	164	134	65	1	658	1,344	88	39	116	86	....	....
....	8	....	2	..	..	18	....	9	44	23	2	....	....	39	166	3	....	9	23	1	....
64	50	37	2	1	2	17	1	76	170	99	45	29	....	744	165	23	20	47	40	....	....
34	66	6	2	1	..	175	9	63	529	183	8	4	2	358	1,699	492	780	871	571	....	....
44	12	11	....	1	..	26	....	38	161	110	8	6	....	192	411	25	5	18	34	....	....
243	220	95	1	..	..	130	5	297	386	592	59	24	....	4,926	2,679	416	64	127	152	....	....
63	34	8	22	4	5	125	7	73	619	211	23	14	1	1,061	3,465	53	12	171	406	....	1
....	....	....	....	..	..	....	....	2	3	1	....	....	....	....	5	....	....	3	....	....	....
6	1	1	12	2	2	256	....	5	78	45	15	3	9	377	730	74	16	127	102	....	....
15	15	9	194	2	..	746	3	38	402	381	97	46	2	986	1,773	186	61	223	60	11	....
14	13	6	354	3	3	940	4	36	413	417	38	19	1	1,449	2,258	308	104	193	73	1	....
15	13	6	22	1	1	179	1	23	203	59	15	5	9	323	694	47	78	108	72	....	....
22	2	....	4	..	..	1	....	5	84	160	....	....	....	8	739	....	....	....	3	....	....
....	1	....	....	..	..	1	....	....	....	1	....	....	....	2	2	....	....	....	....	....	....
....	....	....	....	..	..	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....
2	....	....	....	..	..	....	....	....	3	1	....	....	....	2	5	....	....	1	1	....	....
8	14	1	....	..	..	3	....	4	25	26	4	2	....	90	39	....	....	....	....	....	....
1	....	....	....	..	..	....	....	....	1	....	....	....	....	1	....	....	....	1	....	....	....
63	62	19	861	7	5	2,123	7	120	1,004	736	219	145	64	3,520	6,524	1,569	1,005	1,861	499	14	....
11	9	....	2	..	..	....	....	6	3	4	1	....	....	23	26	....	....	1	4	....	....
6	6	1	8	1	5	65	1	6	47	14	1	2	1	157	230	13	82	61	26	....	....
8	14	3	16	1	1	170	....	19	143	100	16	4	2	254	422	163	156	215	224	1	....
24	27	11	498	5	5	1,240	3	99	696	581	62	18	20	2,180	4,276	1,275	971	1,466	221	9	....
15	11	10	1	..	..	18	....	11	39	22	13	11	3	51	226	32	48	185	110	1	1
....	....	....	....	..	..	1	....	....	1	1	....	....	....	....	....	2	....	....	1	....	....
11	8	1	....	..	..	10	1	8	46	18	20	1	....	37	77	13	47	80	89	....	....
3	13	1	....	..	..	3	....	3	15	4	3	1	....	16	36	15	5	31	42	....	....
5	3	....	15	..	..	63	1	3	33	28	6	....	6	128	468	75	22	175	16	....	....
3	10	1	....	..	..	24	1	8	133	24	....	....	....	72	219	22	13	51	7	....	....
3	4	....	....	..	..	....	....	2	4	2	....	....	....	15	17	4	....	1	1	....	....
4	4	....	....	..	..	....	....	1	10	2	3	1	....	10	12	2	1	3	1	....	....
13	12	7	....	..	..	7	....	4	21	8	1	1	....	95	82	3	18	45	32	....	....
3	2	....	....	..	..	2	....	2	19	4	3	....	....	14	12	2	....	4	1	....	....
....	....	....	....	..	..	1	....	1	....	....	....	....	....	1	....	....	....	1	....	....	....
3,386	3,876	1,309	2,241	68	69	8,018	126	2,263	11,872	8,545	2,384	1,082	222	22,403	59,126	7,724	5,185	10,043	10,075	44	9

Table

Origin, Sex, Occupation and Destination of Immigrant Arrivals

Racial Origin	Sex				Totals	Trade or								
	18 Years and Over		Under 18 Years			Farming Class			Unskilled and Semi-skilled Workers			Skilled Workers		
	Males	Females	Males	Females		Males	Females	Children	Males	Females	Children	Males	Females	Children
Albanian	2	1	3	.....	6	.....	.....	.....	.....	.....	.....	2	.....	.....
Arabian	2	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Armenian	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belgian	11	12	7	6	36	7	3	8	.....	.....	.....	2	1	1
Bohemian	2	2	2	.....	6	1	.....	.....	.....	.....	.....	1	1	2
British—														
English	768	945	232	263	2,208	103	51	48	92	53	31	217	75	60
Irish	318	366	103	129	916	47	22	34	49	27	17	80	21	38
Scottish	294	359	99	77	829	36	13	9	33	22	6	92	28	38
Welsh	33	29	10	7	79	2	.....	.....	1	2	.....	8	1	4
Chinese	1	2	.....	.....	3	.....	.....	.....	1	.....	.....	.....	.....	.....
Croatian	2	2	.....	.....	4	.....	.....	.....	.....	.....	.....	1	1	.....
Czech	16	15	2	2	35	2	2	.....	2	1	.....	2	2	.....
Dutch	86	88	38	35	247	21	6	4	7	10	6	15	7	10
East Indian	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Esthonian	.....	2	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Finnish	9	11	6	4	30	1	.....	.....	1	2	.....	3	2	6
French	286	338	69	95	788	46	21	25	42	20	8	70	34	20
German	214	272	84	69	639	29	17	19	25	17	3	58	20	15
Greek	30	24	10	3	67	2	.....	.....	4	1	.....	1	2	2
Hebrew	200	212	43	55	510	3	2	1	15	4	.....	50	19	10
Italian	69	56	12	21	158	2	1	.....	16	7	1	26	6	8
Jugo-Slavian	5	12	5	6	28	1	1	4	1	.....	1	.....	2	.....
Lithuanian	5	7	1	2	15	1	.....	2	2	1	.....	1	1	.....
Magyar	12	16	5	4	37	3	1	2	3	1	1	3	2	.....
Maltese	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mexican	1	1	1	.....	3	.....	.....	.....	1	.....	.....	.....	.....	.....
Negro	40	16	11	8	75	5	2	5	23	3	2	5	.....	.....
North American Indian	6	14	2	4	26	3	.....	1	2	2	.....	1	2	.....
Polish	48	46	9	16	119	2	3	4	12	4	3	18	3	1
Portuguese	.....	1	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Roumanian	6	3	.....	.....	9	2	.....	.....	1	1	.....	.....	.....	.....
Russian	17	17	1	3	38	2	.....	.....	1	.....	.....	6	5	1
Ruthenian	13	12	3	2	30	4	1	3	4	.....	1	1	.....	.....
Scandinavian—														
Danish	22	26	12	7	67	5	1	2	.....	2	.....	6	4	.....
Icelandic	4	1	2	.....	7	.....	.....	.....	1	.....	.....	1	.....	.....
Norwegian	44	36	17	12	109	18	6	4	5	2	.....	8	1	4
Swedish	40	30	7	13	90	7	.....	6	6	1	1	9	3	4
Serbian	5	3	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....
Slovak	4	10	2	.....	16	1	.....	.....	.....	.....	.....	2	.....	2
Spanish	1	2	.....	1	4	.....	.....	.....	1	.....	.....	.....	.....	.....
Spanish American	5	5	2	2	14	.....	.....	.....	.....	.....	.....	1	.....	.....
Swiss	12	10	5	2	29	2	.....	.....	1	1	.....	4	1	1
Syrian	3	7	1	1	12	.....	.....	.....	.....	1	.....	.....	1	.....
Totals	2,636	3,014	806	850	7,306	358	153	181	352	185	81	694	245	227

from the United States, for the Fiscal Year ended March 31, 1949

11

Occupation											Destination										
Trading and Clerical Classes			Mining Class			Female Domestic Servants		Other Classes													
Males	Females	Children	Males	Females	Children	18 yrs. and over	Under 18 yrs.	Males	Females	Children	Nova Scotia	New Brunswick	Prince Edward Island	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon Territory	Northwest Territories
.....	.....	3	.....	..	..	.....	....	.....	1	.....	3	.....	.....	3	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	..	..	.....	....	2	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	..	..	.....	....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....
1	3	.....	.....	..	..	.....	....	1	5	4	.....	.....	.....	3	32	.....	.....	.....	1	.....	.....
.....	.....	.....	.....	..	..	.....	....	.....	1	.....	.....	.....	.....	.....	1	5	.....	.....	.....	.....	.....
180	147	58	5	5	1	7	....	171	607	297	157	100	22	303	1,065	37	36	131	346	9	2
81	48	21	3	..	1	4	....	58	244	121	50	34	15	102	491	18	12	73	118	3	....
66	54	25	.....	..	2	4	....	67	238	96	78	35	17	70	405	19	15	52	138	....	....
10	2	3	.....	..	..	.....	....	12	24	10	1	1	1	7	43	3	.....	6	16	1	....
.....	.....	.....	.....	..	..	.....	....	.....	2	.....	.....	.....	.....	.....	1	.....	.....	.....	2	....	....
.....	.....	.....	.....	..	..	.....	....	1	1	.....	.....	.....	.....	.....	3	.....	.....	.....	1	....	....
10	4	1	.....	1	..	.....	....	.....	5	3	.....	.....	.....	.....	6	12	1	.....	3	13	....
19	10	6	2	..	1	3	....	22	52	46	15	3	....	26	112	10	4	32	45	....	....
.....	.....	.....	.....	..	..	.....	....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	....	....
.....	1	.....	.....	..	..	.....	....	.....	1	.....	.....	.....	.....	1	1	.....	.....	.....	.....	....	....
1	2	.....	.....	..	..	.....	....	3	5	4	.....	.....	.....	7	18	.....	.....	4	1	....	....
55	36	15	4	1	6	5	....	69	221	90	42	83	3	390	208	6	8	23	25	....	....
52	36	24	4	2	2	1	....	46	179	90	22	4	....	44	362	29	44	54	77	3	....
16	3	4	.....	..	..	.....	....	7	18	7	1	.....	.....	37	21	.....	.....	1	7	....	....
96	41	29	.....	..	..	1	....	36	145	58	14	7	....	201	208	21	1	14	44	....	....
17	7	6	1	..	..	.....	....	7	35	18	1	2	....	47	75	4	1	8	20	....	....
1	1	.....	.....	1	..	.....	....	2	7	6	.....	.....	.....	2	18	.....	4	.....	4	....	....
.....	.....	.....	.....	..	..	.....	....	1	5	1	.....	.....	.....	3	11	1	.....	.....	.....	....	....
2	3	.....	.....	..	..	.....	....	1	9	6	.....	.....	.....	3	31	.....	.....	2	1	....	....
.....	.....	.....	.....	..	..	.....	....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	....	....
.....	.....	.....	.....	..	..	.....	....	.....	1	1	.....	.....	.....	.....	3	.....	.....	.....	.....	....	....
2	2	3	.....	..	..	1	....	5	8	9	1	3	....	21	29	4	1	15	1	....	....
.....	.....	.....	.....	..	..	.....	....	.....	10	5	.....	.....	.....	1	16	2	2	3	2	....	....
4	9	1	.....	..	..	3	....	12	24	16	2	.....	....	15	74	14	2	7	5	....	....
.....	.....	.....	.....	..	..	.....	....	.....	1	1	.....	.....	.....	.....	2	.....	.....	.....	.....	....	....
2	.....	.....	.....	..	..	.....	....	1	2	.....	.....	.....	.....	3	5	.....	.....	1	.....	....	....
5	2	1	.....	..	..	.....	....	3	10	2	.....	1	1	6	13	2	7	4	4	....	....
1	3	.....	.....	..	..	1	....	3	7	1	.....	.....	.....	5	17	5	1	2	.....	....	....
5	4	2	.....	..	..	.....	....	6	15	15	.....	3	....	1	24	6	8	6	19	....	....
1	.....	.....	.....	..	..	.....	....	1	1	2	.....	.....	.....	.....	.....	1	1	.....	5	....	....
4	4	5	.....	..	..	.....	....	9	23	16	.....	1	1	11	32	6	24	15	17	2	....
11	3	5	.....	..	..	1	....	7	22	4	1	.....	....	5	37	3	8	15	20	....	1
2	1	.....	.....	..	..	.....	....	3	2	.....	.....	1	.....	.....	6	.....	1	.....	.....	....	....
.....	1	.....	.....	..	..	.....	....	1	9	.....	.....	.....	.....	2	12	.....	.....	1	1	....	....
.....	.....	.....	.....	..	..	.....	....	.....	2	1	.....	.....	.....	.....	4	.....	.....	.....	.....	....	....
3	.....	.....	.....	..	..	.....	....	1	5	4	1	1	....	4	7	.....	.....	1	.....	....	....
3	1	.....	.....	..	..	.....	....	2	7	6	.....	.....	.....	5	8	.....	6	3	7	....	....
3	1	.....	.....	..	..	.....	....	.....	4	2	.....	1	....	6	4	.....	1	.....	.....	....	....
653	429	212	19	10	13	31	....	560	1,961	942	389	280	60	1,342	3,413	197	187	476	941	18	3

Table

Total Immigration to Canada Showing Racial Origin by Country of

Country of Last Permanent Residence	Totals	Albanian	Arabian	Armenian	Belgian	Bosnian	Bohemian	English	Irish	Scottish	Welsh	Bulgarian	Chinese	Croatian	Czech	Dalmatian	Dutch	East Indian	Esthonian	Finnish	French
Africa (British)	111	..	..	..	.....	..	..	54	8	9	1	..	..	..	.....	..	4	..	.....	..	1
Africa (Not British)	85	..	3	..	.....	..	..	4	.....	1	.....	.....	.....	.....	3	..	2	..	.....	.....	17
Australia	439	..	..	..	.....	..	..	292	45	51	3	..	1	.....	.....	1	2	..	1	...	2
Austria	757	..	..	..	.....	1	..	1	.....	.....	.....	3	...	19	12	..	28	..	5	...	.....
Belgium	1,154	..	..	..	925	..	..	8	.....	.....	.....	.....	.....	.....	7	..	7	..	2	...	69
Bermuda	44	..	..	..	.....	..	..	23	.....	4	.....	.....	.....	.....	.....	..	.....	..	.....	.....	.....
Bulgaria	77	..	..	..	.....	..	..	.....	.....	.....	.....	56	.....	.....	1	..	.....	..	.....	.....	.....
Central America	19	..	..	..	.....	..	..	5	2	.....	.....	.....	.....	.....	.....	..	.....	..	.....	.....	.....
China	387	..	..	..	.....	..	..	79	8	16	.....	..	108	...	1	..	2	..	1	1	3
Czecho-Slovakia	2,192	..	..	..	.....	..	11	2	.....	.....	.....	.....	.....	7	960	..	3	..	.....	.....	1
Denmark	720	..	..	..	1	..	1	5	.....	1	.....	.....	.....	.....	4	..	1	..	1	...	1
Eire	1,101	..	..	..	.....	..	..	26	1,051	6	.....	.....	.....	.....	3	..	1	.....	.....	1	1
England	25,328	1	1	2	11	..	4	21,264	832	1,115	369	..	1	2	64	..	36	1	19	...	64
Esthonia	2,340	..	..	..	.....	..	..	.....	.....	.....	.....	.....	.....	.....	1	..	1	..	2,222	50	1
Finland	169	..	..	..	.....	..	..	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	..	4	154	.....
France	1,278	..	..	3	11	..	..	9	5	.....	.....	6	...	1	9	..	6	..	5	...	777
Germany	3,224	1	..	..	.....	..	..	6	1	.....	.....	.....	.....	6	16	..	128	..	53	1	5
Greece	650	..	..	..	.....	..	..	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	..	.....	.....	.....
Holland	6,879	..	..	..	11	..	..	8	1	1	.....	.....	.....	.....	2	..	6,783	..	.....	...	2
Hungary	1,685	..	..	..	.....	..	..	.....	.....	1	.....	.....	.....	2	2	..	.....	..	.....	.....	.....
India	194	..	..	..	1	..	..	86	8	21	.....	.....	.....	.....	.....	..	.....	59	.....	...	1
Ireland (Northern)	1,457	..	..	..	.....	..	..	65	1,336	44	8	.....	.....	.....	.....	..	.....	..	1	...	.....
Italy	5,230	..	..	..	1	..	..	4	.....	.....	.....	.....	.....	.....	5	..	.....	..	.....	1	.....
Japan	12	..	..	..	.....	..	..	3	.....	.....	.....	.....	.....	.....	.....	..	.....	..	.....	.....	.....
Jugo-Slavia	3,597	..	..	..	.....	4	..	.....	.....	.....	.....	.....	.....	452	9	5	3	..	.....	...	1
Latvia	3,341	..	..	..	.....	..	..	.....	.....	.....	.....	.....	.....	.....	2	..	2	..	18	...	.....
Lesser British Isles	82	..	..	..	.....	..	..	46	1	4	.....	.....	.....	.....	.....	..	.....	..	.....	...	24
Lithuania	4,270	..	..	..	.....	..	..	.....	.....	.....	.....	.....	.....	1	.....	..	1	..	7	...	.....
Malta	762	..	..	..	.....	..	..	12	1	.....	1	..	.....	.....	.....	..	.....	..	.....	...	1
Mexico	62	..	..	..	.....	..	..	6	1	1	.....	.....	.....	.....	.....	..	1	..	.....	.....	1
Newfoundland	3,118	..	..	..	.....	..	..	2,717	286	54	1	.....	.....	.....	.....	..	.....	..	.....	...	51
New Zealand	289	..	..	..	.....	..	..	203	15	46	6	.....	.....	.....	2	..	1	..	.....	...	4
Norway	363	..	..	..	.....	..	..	12	2	2	.....	.....	.....	.....	.....	..	.....	..	.....	1	2
Palestine	112	..	1	..	.....	..	..	2	2	.....	.....	.....	.....	.....	1	..	.....	..	.....	.....	.....
Poland	29,259	1	..	..	.....	..	..	.....	.....	1	.....	.....	.....	3	12	..	142	..	6	...	3
Portugal	14	..	..	..	.....	..	..	5	.....	.....	.....	.....	.....	.....	.....	..	.....	..	.....	.....	.....
Roumania	1,635	..	..	..	.....	..	..	.....	.....	.....	.....	1	.....	.....	3	..	4	..	.....	...	3
Russia	4,417	..	..	..	.....	..	..	1	.....	.....	.....	3	.....	.....	8	..	2,633	..	11	5	.....
St. Pierre and Miquelon	35	..	..	..	.....	..	..	.....	.....	1	.....	.....	.....	.....	.....	..	.....	..	.....	.....	33
Scotland	8,878	..	..	..	2	..	..	434	210	8,062	21	..	.....	.....	.....	..	1	..	.....	1	5
South America	398	..	..	..	5	..	..	82	3	22	1	..	.....	.....	5	..	50	..	.....	1	7
Spain	20	..	..	..	.....	..	..	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	..	.....	.....	.....
Sweden	414	..	..	..	.....	..	..	3	.....	.....	.....	.....	.....	.....	2	..	4	..	173	27	.....
Switzerland	370	..	..	..	.....	..	..	8	.....	3	.....	.....	.....	.....	5	..	1	..	.....	...	8
Syria	61	..	7	5	.....	..	..	2	.....	.....	.....	.....	.....	1	.....	..	.....	..	.....	.....	.....
Ukraine	76	..	..	..	.....	..	..	.....	.....	.....	.....	.....	.....	.....	.....	..	6	..	1	...	.....
United States	7,318	6	2	1	36	..	6	2,215	916	832	79	..	3	4	35	..	247	1	2	30	788
Wales	589	..	..	..	1	..	1	164	19	18	358	.....	.....	.....	.....	..	.....	..	1	...	2
West Indies (British)	391	..	..	..	.....	..	..	179	10	30	1	..	.....	.....	1	..	1	2	.....	...	5
West Indies (Not British)	90	..	..	..	.....	..	..	11	3	4	.....	1	.....	.....	.....	..	7	..	.....	...	16
Others	110	16	1	..	.....	..	..	32	2	2	.....	..	1	...	4	..	5	1	.....	...	2
Totals	125,603	25	15	11	1,005	5	23	28,078	4,769	10,351	849	70	114	498	1,179	6	10,113	64	2,533	273	1,901

12

Last Permanent Residence for the Fiscal Year ended March 31, 1949

German	Greek	Hebrew	Italian	Japanese	Jugo-Slavian	Lettish	Lithuanian	Magyar	Maltese	Mexican	Montenegrin	Moravian	Negro	North American Indian	Persian	Polish	Portuguese	Roumanian	Russian	Ruthenian	Danish	Icelandic	Norwegian	Swedish	Serbian	Slovak	Spanish	Spanish American	Swiss	Syrian	Turkish
4	....	12	.....	..	1	4	.....	.....	..	..	..	..	..	..	..	12	..	...	.....	.....	1	..	...	...	...	...	..	..	...	..	..
1	4	6	2	..	2	.....	.....	.....	2	..	..	..	..	..	1	29	..	...	1	.....	...	..	...	...	...	6	..	..	...	1	..
6	6	12	6	..	.....	.....	.....	.....	..	..	..	..	..	..	..	3	..	...	.....	.....	3	..	...	5	...	...	..	..	...	..	..
132	....	165	.....	..	36	5	19	22	..	..	..	..	..	..	..	56	..	7	30	199	...	..	...	...	14	3	..	..	...	..	..
1	1	70	8	..	.....	1	1	3	..	..	..	..	..	..	..	35	..	...	4	8	1	..	...	...	2	...	..	..	1	..	..
.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	7	.....	.....	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	....	.....	.....	..	1	.....	.....	.....	..	..	..	..	..	..	..	.....	..	...	16	2	...	..	...	...	...	...	..	..	...	..	..
1	....	2	1	..	.....	.....	.....	.....	..	..	..	..	..	..	..	1	..	1	.....	.....	...	..	...	...	...	...	..	5	1	..	..
10	....	72	.....	..	.....	.....	.....	3	..	..	..	..	..	..	..	7	3	...	69	.....	1	..	1	...	...	...	2	..	...	..	..
237	1	383	1	..	50	1	.....	87	..	..	..	6	..	..	..	16	..	1	7	73	...	..	...	...	1	344	..	..	...	..	..
21	....	11	.....	..	.....	4	7	.....	..	..	..	..	..	..	..	.....	..	1	7	7	643	..	1	3	...	...	..	..	...	..	..
4	....	5	1	..	.....	.....	.....	.....	..	..	..	..	..	..	..	.....	..	...	1	.....	...	..	...	...	...	...	..	..	1	..	..
195	16	831	53	..	4	4	25	39	3	..	..	3	2	..	..	204	10	9	40	24	19	..	21	11	1	3	5	..	19	1	..
14	....	6	.....	..	.....	21	2	.....	..	..	..	..	..	..	..	3	..	...	15	2	...	..	...	2	...	...	...	..	..	...	..	..
4	....	.....	.....	..	.....	.....	.....	.....	..	..	..	..	..	..	..	1	..	...	1	.....	1	..	...	4	...	...	...	..	..	...	..	..
14	4	138	23	..	4	.....	5	17	..	..	..	..	..	..	..	154	1	5	22	42	1	..	...	...	3	6	3	..	3	1	..
383	....	569	3	..	18	140	252	16	..	..	..	..	1	..	..	707	..	28	157	716	2	..	...	...	14	...	...	..	...	..	1
1	649	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	....	33	.....	..	1	2	.....	1	..	..	..	..	..	..	..	6	..	...	6	6	...	..	...	...	...	...	..	..	1	..	..
280	....	318	.....	..	5	.....	.....	1,068	..	..	..	..	..	..	..	1	..	4	.....	2	...	..	...	...	1	...	..	..	1	..	..
2	1	5	2	..	.....	1	.....	1	..	..	..	..	..	..	..	.....	..	1	4	.....	...	..	...	...	...	...	..	..	1	..	..
.....	.....	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	3	91	5,063	..	11	.....	.....	2	..	..	..	..	..	..	..	24	..	1	3	6	...	..	...	...	9	1	..	..	...	..	..
2	....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
839	1	27	3	..	1,282	1	.....	43	..	..	3	..	..	..	..	3	..	4	45	16	...	..	...	...	844	12	..	..	...	..	..
34	....	7	.....	..	.....	3,181	43	.....	..	..	..	..	..	..	..	13	..	...	27	12	...	..	...	2	...	...	..	..	...	..	..
.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	..	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	2	.....	.....
94	3	65	.....	..	6	23	4,041	.....	.....	.....	.....	.....	.....	.....	.....	11	..	1	11	6	...	..	...	...	...	...	..	..	...	..	..
.....	1	.....	2	..	.....	.....	.....	.....	743	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	..
.....	.....	4	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	8	2	.....	.....
1	....	3	.....	..	.....	.....	.....	.....	..	..	..	..	..	..	..	.....	1	...	.....	.....	1	..	1	1	...	...	..	..	...	1	..
.....	.....	4	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	4	..	1	...	1	...	.....	.....	.....	.....	.....
1	....	2	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	..	333	1	...	2	1	.....	.....	.....	.....
1	....	89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	...	2	4	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....
1,437	....	4,713	4	..	23	14	19	5	..	..	..	..	..	..	..	13,896	..	16	167	8,793	...	..	...	...	3	...	..	..	1	..	..
.....	....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
522	....	472	.....	1	1	.....	.....	20	..	..	..	..	..	..	..	9	..	473	10	113	...	..	...	...	3	...	..	..	...	..	..
377	1	108	.....	..	2	24	10	4	..	..	..	..	..	..	..	38	..	6	785	401	...	..	...	...	...	...	..	..	...	..	..
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....
7	1	44	19	..	.....	.....	7	1	..	..	..	..	..	..	..	51	..	1	4	1	...	..	3	1	...	2	..	..	...	..	..
29	2	59	9	..	2	5	.....	10	..	..	..	..	11	..	..	39	13	3	20	1	1	..	1	1	...	5	2	7	1	1	..
.....	....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....
6	....	42	.....	..	.....	12	8	3	..	..	..	..	..	..	..	17	..	...	.....	1	...	..	...	114	...	...	..	..	2	..	..
71	....	16	1	..	1	1	.....	4	..	..	..	..	..	..	..	5	..	4	.....	.....	1	..	...	...	...	...	..	..	241	..	..
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	17	..	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	..
4	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	..	...	1	61	...	.....	.....	.....	...	...	.....	.....	.....	.....	.....
640	67	510	159	..	28	.....	15	37	1	3	..	..	75	26	..	119	2	9	38	30	67	7	109	90	8	16	4	14	29	12	..
4	....	12	1	..	.....	.....	1	.....	1	..	..	..	..	..	..	3	..	...	.....	.....	...	.....	2	1	...	...	..	..	...	..	..
2	....	22	.....	..	1	.....	.....	.....	.....	.....	.....	.....	108	.....	.....	1	15	...	1	.....	1	..	...	1	...	...	2	7	...	1	..
.....	.....	21	1	.....	.....	1	.....	1	.....	.....	.....	.....	6	.....	.....	1	1	7	.....	.....	.....	.....	.....	1	.....	.....	2	6	.....	.....	.....
22	5	1	1	..	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	2	..	...	1	2	...	3	...	...	...	...	1	..	...	1	1
5,424	766	8,957	5,365	8	1,481	3,445	4,459	1,388	751	7	3	9	210	26	2	15,539	57	582	1,495	10,528	748	10	473	239	904	400	42	47	306	48	2

Table 13

Immigration to Canada, Showing Nationality and Sex for the Fiscal Year ended March 31, 1949

Nationality	From Overseas					From the United States					Grand Totals
	Totals	18 Years and Over		Under 18 Years		Totals	18 Years and Over		Under 18 Years		
		M.	F.	M.	F.		M.	F.	M.	F.	
Albanian	17	14	3	.....	.....	.....	.....	.....	.....	.....	17
Austrian	160	63	68	12	17	8	4	4	.....	.....	168
Belgian	1,028	384	311	164	169	10	4	4	2	.....	1,038
British	42,830	16,911	16,010	5,028	4,881	510	194	275	15	26	43,340
Bulgarian	72	29	36	3	4	.....	.....	.....	.....	.....	72
Central American	6	3	3	.....	.....	2	1	1	.....	.....	8
Chinese	55	9	26	12	8	2	1	1	.....	.....	57
Czecho-Slovakian	2,275	796	1,025	228	226	11	6	4	.....	1	2,286
Danish	690	373	173	69	75	6	3	2	1	.....	696
Danzig	13	1	8	2	2	.....	.....	.....	.....	.....	13
Dutch	6,875	2,277	1,631	1,611	1,356	19	7	9	2	1	6,894
Esthonian	2,588	905	1,208	260	215	2	.....	2	.....	.....	2,590
Finnish	175	49	88	23	15	15	5	4	4	2	190
French	1,020	404	328	141	147	29	15	12	1	1	1,049
German	301	49	160	43	49	15	4	9	2	.....	316
Greek	664	239	253	109	63	40	19	14	5	2	704
Hungarian	1,808	666	728	222	192	8	2	4	1	1	1,816
Icelandic	4	.....	3	.....	1	1	.....	.....	1	.....	5
Irish Republican	109	86	20	2	1	1	1	.....	.....	.....	110
Italian	5,075	2,971	1,285	437	382	13	7	6	.....	.....	5,088
Japanese	7	4	2	.....	1	.....	.....	.....	.....	.....	7
Jugo-Slavian	3,809	2,015	1,274	260	260	7	1	3	3	.....	3,816
Latvian	3,551	1,323	1,579	319	330	.....	.....	.....	.....	.....	3,551
Leitchenstein	2	2	.....	.....	.....	.....	.....	.....	.....	.....	2
Lithuanian	4,609	1,833	1,908	412	456	2	.....	1	.....	1	4,611
Luxemburg	11	3	5	1	2	.....	.....	.....	.....	.....	11
Mexican	19	3	9	2	5	.....	.....	.....	.....	.....	19
Norwegian	359	149	138	34	38	12	5	4	1	2	371
Polish	32,544	16,368	10,494	2,905	2,777	50	28	20	1	1	32,594
Portuguese	11	5	2	1	3	.....	.....	.....	.....	.....	11
Roumanian	1,808	650	719	223	216	4	3	1	.....	.....	1,812
Russian	4,989	1,388	2,042	824	735	7	4	3	.....	.....	4,996
South American	51	10	12	14	15	1	.....	1	.....	.....	52
Spanish	28	12	9	4	3	1	.....	1	.....	.....	29
Swedish	122	56	41	17	8	6	2	4	.....	.....	128
Swiss	337	168	91	42	36	3	3	.....	.....	.....	340
Syrian	39	11	21	3	4	1	.....	1	.....	.....	40
Turkish	5	3	2	.....	.....	1	.....	1	.....	.....	6
Ukrainian	119	58	40	9	12	.....	.....	.....	.....	.....	119
U.S.A. Citizens	72	14	32	11	15	6,519	2,317	2,623	767	812	6,591
West Indian (Not British)	24	7	12	2	3	.....	.....	.....	.....	.....	24
Others	16	6	8	.....	2	.....	.....	.....	.....	.....	16
Totals	118,297	50,317	41,807	13,449	12,724	7,306	2,636	3,014	806	850	125,603

Table 14

Rejections from Overseas, by Causes and Nationality, from 1902-03 to 1948-49 and Total Rejections from the United States from 1908-09 to 1948-49

—	Fiscal Years														
	1902-3 to 1912-13	1913-14 to 1922-23	1923-1924	1924-1925	1925-1926	1926-1927	1927-1928	1928-1929	1929-1930	1930-1931	1931-1932	1932-1933	1933-1934	1934-1935	1935-1936
FROM OVERSEAS															
By Causes															
Medical	4,162	1,029	130	83	40	95	104	94	78	39	26	16	17	9	13
Civil	5,094	5,604	862	948	226	594	215	266	243	444	298	213	177	206	183
Totals	9,256	6,633	992	1,031	266	689	319	360	321	483	324	229	194	215	196
By Nationality															
British	1,240	978	187	199	109	209	150	154	160	251	180	126	123	150	123
American	175	134	6	11	.....	5	2	3	8	6	4	13	11	13	7
Other countries	7,841	5,521	799	821	157	475	167	203	153	226	140	90	60	52	66
Totals	9,256	6,633	992	1,031	266	689	319	360	321	483	324	229	194	215	196
	1908-9 to 1912-13														
TOTALS FROM U.S.A.	68,454	171,009	10,311	10,553	12,219	12,819	15,938	18,110	24,718	39,434	36,867	28,939	18,878	14,426	12,290
GRAND TOTALS	77,710	177,642	11,303	11,584	12,485	13,508	16,257	18,470	25,039	39,917	37,191	29,168	19,072	14,641	12,486

—	Fiscal Years													
	1936-1937	1937-1938	1938-1939	1939-1940	1940-1941	1941-1942	1942-1943	1943-1944	1944-1945	1945-1946	1946-1947	1947-1948	1948-1949	Totals
FROM OVERSEAS														
By Causes														
Medical	11	8	7	10	11	20	16	16	16	24	24	33	42	6,173
Civil	236	202	170	167	225	129	122	169	130	314	403	341	352	18,533
Totals	247	210	177	177	236	149	138	185	146	338	427	374	394	24,706
By Nationality														
British	138	86	94	124	95	90	89	141	110	246	260	205	208	6,225
American	7	4	9	5	4	1	1	1	5	.....	7	4	3	449
Other countries	102	120	74	48	137	58	48	43	31	92	160	165	183	18,032
Totals	247	210	177	177	236	149	138	185	146	338	427	374	394	24,706
TOTALS FROM U.S.A.	13,178	11,094	10,160	9,996	11,821	7,368	3,424	2,866	2,716	6,396	8,561	7,799	7,456	597,800
GRAND TOTALS	13,425	11,304	10,337	10,173	12,057	7,517	3,562	3,051	2,862	6,734	8,988	8,173	7,850	622,506

Table

Immigration to Canada, from Overseas Showing Intended Occupation

Intended Occupation	Totals	Albanian	Arabian	Armenian	Belgian	Bosnian	Bohemian	English	Irish	Scottish	Welsh	Bulgarian	Chinese	Croatian	Czech	Dalmatian	Dutch	East Indian	Esthonian	Finnish	French
Farming Class	21,794	7	2	..	297	1	1	1,341	456	376	48	10	...	132	178	..	3,149	..	257	21	113
Clerical Class	3,979	..	..	1	13	..	..	2,223	275	698	48	1	...	2	36	..	54	..	27	7	52
Professional Class	1,857	..	..	1	11	..	3	621	135	204	22	2	3	3	31	..	42	1	20	5	85
Merchant Class	2,199	..	1	2	4	..	2	1,072	174	395	24	1	4	2	30	..	35	1	5	1	38
Miscellaneous	897	..	1	1	4	..	2	207	34	54	9	2	6	1	20	..	38	6	10	3	24
Skilled Workers																					
Skilled Workers, N.E.S.	3,739	..	..	..	8	..	2	1,845	219	708	65	1	...	5	37	..	39	2	27	6	54
Bakers	183	..	..	..	2	..	..	32	9	45	...	...	...	1	1	..	7	..	3	...	5
Barbers	206	..	..	..	1	..	..	70	11	31	...	...	...	...	...	..	1	..	2	1	8
Blacksmiths	86	..	..	..	..	..	..	10	3	13	1	...	...	...	1	..	2	..	...	...	...
Bookbinders	19	..	..	..	..	..	..	8	...	4	...	...	...	...	...	..	1	..	...	...	...
Butchers	211	..	..	..	1	..	..	58	14	34	1	...	...	2	2	..	8	..	4	1	4
Cabinetmakers	157	..	..	..	1	..	..	29	1	12	...	...	...	...	2	..	1	..	6	...	2
Carpenters	1,222	..	..	..	4	..	..	467	65	155	7	...	...	3	2	..	13	..	43	5	7
Dressmakers	548	..	..	..	1	..	..	89	9	19	...	...	...	...	5	..	9	..	16	3	6
Engravers	12	..	..	..	..	..	..	5	1	4	...	...	...	...	...	..	...	..	...	...	1
Engineers, Locomotive	12	..	..	..	..	..	..	7	...	3	...	...	...	...	...	..	...	..	...	...	...
Engineers, Marine	174	..	..	..	..	..	..	72	14	73	1	...	...	...	...	..	...	..	4	...	1
Engineers, Stationary	14	..	..	..	..	..	..	8	1	3	...	...	...	...	...	..	...	..	...	...	...
Electricians	760	..	..	..	1	..	..	370	45	144	8	...	...	...	5	..	3	..	12	...	5
Fur Workers	452	1	..	..	..	..	..	11	1	5	...	...	...	1	5	..	...	..	10	...	2
Hat and Cap Makers	23	..	..	..	..	..	..	2	...	...	...	...	...	...	...	..	...	..	...	...	...
Jewellers. Goldsmiths, Silversmiths	29	..	..	..	..	..	..	9	1	1	...	...	...	...	2	..	...	..	2	...	...
Locksmiths	114	..	..	..	..	..	..	...	...	...	...	...	...	...	...	..	4	..	1	...	...
Machinists	254	..	..	..	1	..	..	123	24	64	2	...	...	...	...	..	2	..	3	...	6
Masons and Bricklayers	488	..	..	..	2	..	..	123	29	70	7	...	...	...	3	..	2	..	6	...	...
Millers	32	..	..	..	..	..	..	7	1	2	...	...	...	...	...	..	3	..	1	...	...
Milliners	17	..	..	..	..	..	..	5	1	1	...	...	...	...	...	..	...	..	...	...	1
Painters and Glaziers	323	..	..	..	..	..	..	136	35	72	4	...	...	...	...	..	1	..	8	1	2
Pattern Makers	10	..	..	..	..	..	..	3	...	7	...	...	...	...	...	..	...	..	...	...	...
Photographers	115	..	..	..	..	..	..	61	3	6	4	...	...	...	...	..	2	..	...	...	2
Plasterers	120	..	..	..	..	..	..	38	13	29	2	...	...	...	...	..	1	..	5	...	...
Plumbers	213	..	..	..	1	..	..	105	16	61	2	...	...	...	...	..	1	..	...	...	2
Printers, Pressmen and Printing Trades	200	..	..	..	2	..	..	109	7	37	1	...	...	...	...	..	1	..	1	...	6
Shoemakers	240	..	..	..	..	..	..	25	6	9	...	...	...	...	2	..	5	..	3	1	...
Seamstresses	69	..	..	..	..	..	..	5	...	1	...	...	...	...	1	..	5	..	13	...	1
Stonecutters	6	..	..	..	..	..	..	...	...	2	...	...	...	...	...	..	...	..	1	...	...
Sheet Metal Workers	141	..	..	..	..	..	..	72	11	38	3	...	...	...	...	..	2	..	...	...	1
Tailors	2,215	..	..	..	1	..	..	70	12	21	2	2	...	18	10	..	7	..	16	...	2
Tanners	9	..	..	..	..	..	..	1	...	...	...	...	...	...	...	..	...	..	...	...	...
Textile Workers, including Weavers and Spinners	664	..	..	..	1	..	1	110	26	73	...	...	...	2	22	..	1	..	101	1	7
Upholsterers	60	..	..	..	1	..	..	26	3	6	1	...	...	...	...	..	2	1	1	...	...
Watch and Clock Makers	53	..	..	..	..	..	..	12	1	3	...	...	...	...	1	..	1	..	2	...	2
Woodworkers, N.E.S.	83	..	..	..	..	..	..	32	3	14	...	...	...	...	1	..	2	..	3	...	3
Automobile Mechanics	617	..	..	..	1	..	..	262	56	88	7	...	...	2	2	..	5	..	27	1	6
Boilermakers	40	..	..	..	..	..	..	13	2	22	...	...	...	...	...	..	...	..	...	...	...
Iron Workers, N.E.S.	13	..	..	..	..	..	..	8	...	1	...	...	...	...	...	..	...	..	...	...	...
Moulders	60	..	..	..	..	..	..	22	7	25	1	...	...	...	...	..	...	..	...	...	1
Unskilled and Semi-skilled Workers																					
Unskilled and Semi-skilled, N.E.S.	3,225	..	..	1	12	..	1	966	225	421	45	4	1	8	43	..	226	2	58	14	47
Lumbermen	391	..	..	..	..	..	..	168	32	21	5	...	...	1	5	..	5	1	18	7	12
Miners	2,242	..	..	..	1	..	..	75	10	44	8	2	...	5	4	..	7	..	69	2	2
Fishermen	70	..	..	..	..	..	..	32	11	2	...	...	...	...	...	1	...	..	11	1	...
General Labourers	2,477	7	..	..	5	..	..	477	201	113	15	1	1	22	55	..	15	4	11	5	18
Manufacturing	1,186	..	..	..	2	..	..	426	101	182	15	...	...	2	19	..	11	1	64	4	11
Construction	2,478	..	..	..	2	1	..	164	48	77	10	...	...	6	7	4	5	..	155	7	2
Transportation	2,478	..	1	..	4	..	..	444	91	174	16	5	...	71	10	1	10	..	40	2	4
Apprentices to Skilled Trades	507	..	..	..	..	..	..	140	21	67	5	1	...	2	3	..	6	..	6	1	5
Domestic Servants	8,145	3	..	..	8	..	..	393	95	225	6	10	...	76	76	..	298	..	566	18	18
Dependent Children	25,407	1	4	..	309	2	3	5,920	615	2,201	138	7	18	57	192	..	3,985	17	455	49	272
Dependent Wives	21,242	..	3	2	243	1	2	5,445	535	1,919	197	14	77	57	276	..	1,621	27	399	65	225
Occupation not given	3,720	..	1	2	25	..	..	1,296	144	443	40	7	1	13	55	..	228	..	39	11	48
	118,297	19	13	10	969	5	17	25,870	3,853	9,522	770	70	111	494	1,144	6	9,866	63	2,531	243	1,113

15

by Racial Origin for the Fiscal Year ended March 31, 1949

German	Greek	Hebrew	Italian	Japanese	Jugo-Slavian	Lettish	Lithuanian	Magyar	Maltese	Mexican	Montenegrin	Moravian	Negro	Persian	Polish	Portuguese	Roumanian	Russian	Ruthenian	Danish	Icelandic	Norwegian	Swedish	Serbian	Slovak	Spanish	Spanish American	Swiss	Syrian	Turkish
1,378	86	313	1,371	1	491	375	629	288	7	..	3	2	2	..	6,056	3	152	380	2,912	299	..	54	29	413	73	2	1	85	..	..
43	6	165	46	..	6	16	19	13	20	1	..	..	19	..	61	16	2	10	30	14	..	15	8	4	8	3	5	11	1	..
46	16	181	36	1	1	61	38	21	4	..	..	..	6	..	97	7	4	19	94	12	..	6	1	3	7	1	1	2	2	1
22	42	184	37	..	1	3	4	8	4	..	..	2	3	1	39	2	7	9	10	6	..	1	3	2	2	2	2	9	3	..
15	33	181	54	2	2	16	26	14	2	..	..	..	5	..	66	1	...	9	31	2	..	4	3	1	1	3	1	1	2	..
37	14	181	140	..	5	27	12	16	83	..	..	..	3	..	79	5	7	9	37	13	..	30	7	3	2	1	2	8	..	..
10	2	35	9	..	.....	1	.....	1	4	..	..	..	..	..	5	..	2	.....	6	1	..	1	..	1	.....	.....	.....	.....	.....	..
5	1	27	19	..	2	1	.....	4	.....	.....	.....	.....	2	..	6	2	3	.....	3	.....	.....	3	1	1	.....	1	.....	.....	.....	..
8	....	2	9	..	4	1	3	2	7	.....	.....	.....	.....	.....	7	..	1	.....	10	1	.....	.....	.....	1	.....	.....	.....	.....	.....	..
.....	....	3	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
6	....	56	1	..	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	11	..	.....	.....	6	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
1	....	11	12	..	.....	6	26	1	.....	.....	.....	.....	2	..	23	..	2	2	15	1	.....	.....	.....	.....	.....	.....	.....	1	.....	..
22	3	96	99	..	4	14	26	9	68	.....	.....	.....	6	..	41	..	3	5	36	3	..	13	1	.....	2	.....	.....	.....	.....	..
17	5	160	25	..	3	23	37	6	3	.....	.....	.....	3	..	62	..	4	8	27	1	..	4	.....	2	.....	.....	.....	.....	1	..
.....	....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
1	....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	1	..	2	1	.....	.....	.....	.....	.....	.....	..
.....	....	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
4	1	39	20	..	2	4	11	2	31	.....	.....	.....	1	..	25	..	1	4	12	2	..	4	1	..	2	.....	.....	1	.....	..
1	3	339	1	..	2	3	3	14	.....	.....	.....	.....	.....	.....	24	..	8	3	13	.....	.....	1	.....	.....	.....	.....	.....	1	.....	..
1	2	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	2	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	..
11	....	42	.....	..	4	1	3	4	.....	.....	.....	.....	.....	.....	17	..	1	3	23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
2	....	8	4	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	6	.....	.....	1	1	1	..	2	.....	1	.....	.....	.....	1	.....	..
13	....	11	128	..	2	14	15	3	5	.....	.....	.....	.....	.....	25	.....	.....	1	23	4	..	1	.....	1	.....	.....	.....	.....	.....	..
1	....	6	1	.....	.....	2	1	2	.....	.....	.....	.....	.....	.....	1	.....	.....	1	2	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	..
1	....	4	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
2	1	23	8	..	2	1	.....	2	9	.....	.....	.....	1	..	4	..	2	.....	2	3	..	2	1	.....	.....	.....	.....	.....	.....	..
.....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
2	....	15	2	.....	.....	.....	1	1	3	.....	..	.....	.....	.....	7	.....	.....	.....	3	1	.....	1	.....	.....	.....	.....	.....	.....	.....	..
.....	....	1	8	.....	.....	7	4	.....	8	.....	.....	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
1	....	4	1	.....	.....	1	.....	.....	13	.....	.....	.....	1	..	2	.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	..
1	....	18	1	.....	.....	.....	1	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	2	..	1	.....	1	.....	.....	.....	.....	.....	..
8	6	69	52	..	.....	2	7	5	.....	.....	.....	.....	.....	.....	19	.....	.....	1	19	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	..
3	....	12	1	..	1	2	3	2	.....	.....	.....	.....	4	..	4	.....	.....	3	4	.....	..	1	.....	1	.....	1	.....	1	.....	..
.....	....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	....	7	1	.....	.....	1	.....	.....	3	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
15	3	1,338	71	..	29	28	82	25	4	.....	.....	.....	1	..	142	..	9	30	265	.....	.....	2	1	6	2	.....	.....	1	.....	..
1	1	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
4	....	85	2	..	1	65	44	5	.....	.....	.....	.....	.....	.....	77	..	3	1	26	.....	.....	2	.....	2	1	1	.....	.....	.....	..
.....	....	14	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	....	18	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	2	1	.....	.....	.....	.....	.....	.....	.....	2	.....	..
5	....	8	2	.....	.....	3	1	.....	.....	.....	.....	.....	.....	.....	3	..	1	.....	.....	1	..	1	.....	.....	.....	.....	.....	.....	.....	..
5	1	25	48	..	1	7	7	5	8	.....	.....	.....	3	..	17	..	1	2	19	2	..	4	1	1	3	.....	.....	.....	.....	..
.....	....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
.....	....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..
206	63	99	163	..	24	74	63	34	7	..	..	..	4	..	199	1	17	27	87	15	..	17	6	14	14	2	..	13	2	..
1	..	15	23	.....	.....	2	11	.....	.....	.....	.....	.....	.....	.....	30	..	...	1	6	7	..	4	9	2	.....	.....	.....	5	.....	..
2	....	1	22	..	12	194	355	22	4	.....	.....	.....	.....	.....	861	2	8	16	498	1	.....	.....	.....	15	.....	.....	.....	.....	.....	..
.....	....	1	1	..	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....	.....	.....	.....	..
4	20	40	722	..	50	14	17	30	149	.....	.....	.....	2	..	157	1	4	32	167	7	..	2	1	101	4	2	.....	1	.....	..
6	3	54	22	1	4	29	51	5	3	.....	.....	.....	.....	.....	79	2	5	6	68	1	..	2	2	..	.....	.....	4	1	.....	..
3	....	14	28	..	23	333	308	7	9	.....	.....	.....	.....	.....	497	..	1	69	628	.....	.....	1	1	68	.....	.....	.....	.....	.....	..
3	2	19	34	..	188	133	100	58	15	.....	.....	.....	7	..	473	1	8	25	422	1	..	5	1	47	2	1	.....	.....	.....	..
7	4	93	43	..	2	10	5	3	3	.....	.....	.....	2	..	35	..	4	5	33	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	..
184	26	135	132	..	256	749	944	180	1	1	.....	.....	3	..	2,130	..	66	170	1,244	18	1	11	3	64	25	.....	.....	7	2	1
1,336	162	2,201	793	1	145	620	815	218	165	2	..	1	32	..	1,967	8	115	337	1,794	137	1	81	27	63	60	8	5	66	2	..
995	133	1,954	828	2	156	534	645	281	90	.....	.....	2	16	1	1,835	4	108	207	1,820	110	1	64	33	67	161	9	11	48	19	..
346	58	105	182	..	29	62	66	59	.....	.....	.....	1	7	..	211	..	24	60	88	11	..	12	7	10	13	1	1	12	2	..
4,785	699	8,447	5,207	8	1,453	3,445	4,444	1,351	750	4	3	9	135	2	15,420	55	573	1,457	10,498	681	3	364	149	896	384	38	33	277	36	2

Table

Immigration to Canada, from the United States Showing Intended Occu

Intended Occupation	Totals	Albanian	Arabian	Armenian	Belgian	Bohemian	English	Irish	Scottish	Welsh	Chinese	Croatian	Czech	Dutch	East Indian	Esthonian	Finnish	French	German
Farming Class	370	..	..	..	7	1	106	49	38	2	..	..	2	22	..	..	1	46	30
Clerical Class	361	..	..	..	3	..	122	39	52	7	..	..	2	8	..	..	..	38	26
Professional Class	360	..	1	1	..	..	103	42	40	6	..	..	1	16	..	..	3	46	32
Merchant Class	528	..	..	..	1	..	151	62	50	3	..	..	9	15	..	1	1	41	39
Miscellaneous	193	..	1	..	2	..	50	21	13	..	..	..	..	2	..	..	..	70	10
Skilled Workers																			
Skilled Workers, N.E.S.	383	1	..	..	1	..	106	48	54	5	..	1	1	11	..	..	2	33	38
Bakers	8	..	..	..	..	..	1	2	1	..	..	..	..	1	..	..	..	1	..
Barbers	15	..	..	..	..	..	3	1	3	..	..	..	1	..	..	..	..	2	1
Blacksmiths	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Bookbinders	2	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..
Butchers	4	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
Cabinetmakers	5	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	1	..
Carpenters	68	..	..	..	..	..	26	7	5	..	..	..	..	2	..	..	..	13	5
Dressmakers	5	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..
Engravers	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Engineers, Marine	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Engineers, Stationary	2	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1
Electricians	28	..	..	..	..	..	13	..	5	..	..	..	..	1	..	..	..	1	4
Fur Workers	13	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	..	1	1
Machinists	31	..	..	..	..	1	8	2	6	..	..	..	..	..	..	..	1	4	3
Masons and Bricklayers	7	..	..	..	..	..	3	1	1	..	..	..	..	..	..	..	..	..	..
Millers	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Milliners	2	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Painters and Glaziers	15	..	..	..	..	..	5	2	2	..	..	..	..	..	..	..	..	4	1
Patternmakers	4	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	1
Photographers	10	..	..	..	..	..	6	1	..	..	..	..	..	..	..	..	..	1	1
Plasterers	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Plumbers	20	..	..	..	..	..	7	5	2	..	..	..	..	..	..	..	..	2	1
Printers, Pressmen and Printing Trades	11	..	..	..	..	..	3	3	2	..	..	..	..	..	..	..	..	2	..
Shoemakers	3	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Seamstresses	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..
Sheet Metal Workers	8	1	..	..	..	..	3	..	1	..	..	..	..	..	..	..	..	..	1
Tailors	6	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Textile Workers, including Weavers and Spinners	20	..	..	..	..	..	6	..	2	..	..	..	..	..	..	..	..	5	2
Upholsterers	3	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..
Watch and Clock Makers	3	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..
Woodworkers, N.E.S.	5	..	..	..	..	..	1	..	2	..	..	..	..	..	..	..	..	..	..
Automobile Mechanics	39	..	..	..	..	..	19	5	3	3	..	..	..	..	..	..	..	2	1
Boilermakers	2	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..
Iron Workers, N.E.S.	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Moulders	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Unskilled and Semi-skilled Workers																			
Unskilled and Semi-skilled, N.E.S.	205	..	..	..	..	..	52	32	22	2	1	..	..	5	..	..	2	22	18
Lumbermen	40	..	..	..	..	..	8	8	5	..	..	..	..	3	..	..	1	5	2
Miners	19	..	..	..	..	..	5	3	..	..	..	..	..	2	..	..	..	4	4
Fishermen	6	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	2	1
General Labourers	41	..	..	..	..	..	12	3	4	..	..	..	..	1	..	..	..	6	2
Manufacturing	73	..	..	..	..	..	24	11	4	..	..	..	2	2	..	..	..	7	5
Construction	21	..	..	..	..	..	6	6	3	..	..	..	..	..	..	..	..	1	..
Transportation	85	..	..	..	..	..	24	6	10	..	..	..	..	1	..	..	..	13	6
Apprentices to Skilled Trades	18	..	..	..	..	..	3	6	1	1	..	..	..	1	..	..	..	..	1
Domestic Servants	30	..	..	..	..	..	6	4	4	..	..	..	..	3	..	..	..	5	1
Dependent Children	1,605	3	..	..	12	2	482	223	174	17	..	..	4	71	..	..	10	151	150
Dependent Wives	1,970	1	..	..	9	2	589	237	188	23	2	2	12	64	1	1	9	192	203
Occupation not given	650	..	..	..	..	..	235	83	126	10	..	1	1	15	..	..	..	63	47
Totals	7,306	6	2	1	36	6	2,208	916	829	79	3	4	35	247	1	2	30	788	639

16

pation by Racial Origin for the Fiscal Year ended March 31, 1949

Greek	Hebrew	Italian	Jugo-Slavian	Lithuanian	Magyar	Maltese	Mexican	Negro	North American Indian	Polish	Portuguese	Roumanian	Russian	Ruthenian	Danish	Icelandic	Norwegian	Swedish	Serbian	Slovak	Spanish	Spanish American	Swiss	Syrian
2	3	2	1	1	3			5	3	4		2	2	4	5		19	7		1			2	
6	25	10	1		1			2		2		1		2	3		2	3	1	1		2	2	
2	23	4	1	1	1			3		11			1	3	3		5	5	1	1		1	3	
11	84	12	1		3			3		8		1	6	2	4	1	3	8	1			1	2	4
3	6	2	1					1				1	1		1	1	4	1	1			1		
2	29	15			1			3	1	11			4		4		5	4		1			2	
		1													1									
	1	2			1																			
	1																							
	1														1									
	1												1											
								1		1				1			2	3		1			1	
	1		1																					
	3															1								
	7																							1
										2							1	1				1	1	
		2																						
		1																						
	1																							
	1																							
	1									1			1											
					1																			
	1																							
										1			1											
1	2	1								1														
	3	2																						
								1																
	1																							
					1					1														
	1	3		1														1						
					1																			
3	8	8	2	1	2		1	6	1	5				2	2		3	3					2	
	1								1	2							1	3						
		1																						
	1	4		1				1		2							1	1			1			
	1	5			1				2	5		1		2			1							
	1			1	1			1					1											
1	3	2						16		1						1	1							
	2	1								1				1										
	1							1		3				1				1						
13	98	31	10	3	9		1	17	6	24	1		4	4	19	2	29	19		2	1	4	7	2
19	170	44	8	4	9	1	1	11	11	29	1	3	15	7	21	1	26	28	2	8	1	4	7	4
4	28	5	2	2	2			3	1	4			1	1	3		6	2	2	1	1			1
67	510	158	28	15	37	1	3	75	26	119	2	9	38	30	67	7	109	90	8	16	4	14	29	12

Table 17

Deportations, After Having Been Admitted, by Causes, Nationalities, and Provinces, from 1902-03 to 1948-49

—	Fiscal Years														
	1902-3 to 1912-13	1913-14 to 1922-23	1923-1924	1924-1925	1925-1926	1926-1927	1927-1928	1928-1929	1929-1930	1930-1931	1931-1932	1932-1933	1933-1934	1934-1935	1935-1936
By Causes															
Medical causes	2,296	2,213	649	420	410	470	519	650	600	789	697	476	301	144	81
Public charges	2,853	4,517	775	543	506	354	430	444	2,106	2,245	4,507	4,916	2,991	464	125
Criminality	1,083	3,989	511	520	453	447	426	441	591	868	1,006	836	493	267	207
Other civil causes	530	793	93	58	189	149	257	194	107	200	270	277	250	172	163
Accompanying deported persons	145	262	78	145	158	165	254	235	559	274	545	626	439	81	34
Totals	6,907	11,774	2,106	1,686	1,716	1,585	1,886	1,964	3,963	4,376	7,025	7,131	4,474	1,128	610
By Nationalities															
British	4,358	5,226	1,377	985	899	808	1,047	1,083	2,983	3,099	4,248	4,251	2,718	385	157
American	1,066	4,566	417	321	330	351	297	294	228	279	260	331	319	199	146
Other countries	1,483	1,982	312	380	487	426	542	587	752	998	2,517	2,549	1,437	544	307
Totals	6,907	11,774	2,106	1,686	1,716	1,585	1,886	1,964	3,963	4,376	7,025	7,131	4,474	1,128	610
By Provinces															
Maritime Provinces	147	409	38	32	43	48	48	70	93	148	252	244	260	62	42
Quebec	1,589	2,197	301	206	233	233	240	255	480	509	984	1,343	596	163	106
Ontario	2,896	4,243	547	675	620	581	646	600	1,115	1,788	2,828	2,626	1,827	347	167
Manitoba	.....	1,310	802	242	195	177	279	403	1,296	625	1,014	858	408	71	43
Saskatchewan	1,783	691	110	115	113	118	197	173	277	414	767	490	261	91	36
Alberta	.....	1,041	102	134	178	169	260	187	396	511	631	738	467	184	79
British Columbia	491	1,876	206	282	334	259	216	276	306	381	549	832	655	210	137
Yukon Territory	1	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	6,907	11,774	2,106	1,686	1,716	1,585	1,886	1,964	3,963	4,376	7,025	7,131	4,474	1,128	610

—	Fiscal Years													Totals
	1936-1937	1937-1938	1938-1939	1939-1940	1940-1941	1941-1942	1942-1943	1943-1944	1944-1945	1945-1946	1946-1947	1947-1948	1948-1949	
By Causes														
Medical causes	47	42	36	29	12	14	20	15	21	24	17	33	39	11,064
Public charges	110	46	45	18	8	1	.....	2	3	1	11	10	20	28,051
Criminality	117	101	114	110	83	69	100	111	99	95	127	136	108	13,508
Other civil causes	240	203	229	237	322	371	121	101	58	178	179	207	182	6,330
Accompanying deported persons	57	21	10	5	3	3	3	1	.....	.....	.....	1	2	4,106
Totals	571	413	434	399	428	458	244	230	181	298	334	387	351	63,059
By Nationalities														
British	202	134	135	127	108	135	82	74	62	165	153	188	182	35,371
American	167	138	145	147	124	107	104	96	82	61	100	93	78	10,846
Other countries	202	141	154	125	196	216	58	60	37	72	81	106	91	16,842
Totals	571	413	434	399	428	458	244	230	181	298	334	387	351	63,059
By Provinces														
Maritime Provinces	61	27	40	61	136	150	96	85	67	150	101	90	59	3,059
Quebec	129	102	112	103	139	178	48	48	35	68	102	102	92	10,693
Ontario	127	123	121	96	80	82	59	43	41	35	60	91	104	22,568
Manitoba	32	21	22	8	14	4	5	6	3	6	4	8	9	.....
Saskatchewan	26	14	28	9	.....	1	9	9	3	5	8	7	6	18,940
Alberta	77	40	19	32	9	9	7	6	8	7	7	10	6	.....
British Columbia	119	86	92	90	50	34	20	33	24	27	52	79	75	7,791
Yukon Territory	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
Totals	571	413	434	399	428	458	244	230	181	298	334	387	351	63,059

OTTAWA
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