

CANADA



Report of the

**DEPARTMENT OF
RESOURCES
AND DEVELOPMENT**

**For the fiscal year ended
MARCH 31, 1950**

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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 Resources and Development for the fiscal year ended March 31, 1950.

Respectfully submitted,

ROBERT H. WINTERS
Minister of Resources and Development.

*The Honourable Robert H. Winters,
Minister of Resources and Development,
Ottawa.*

Sir:

I have the honour to submit the First Annual Report of the Department of Resources and Development covering the fiscal year which ended on the 31st of March, 1950.

Your obedient servant,

H. L. KEENLEYSIDE,
Deputy Minister.

Annual Report

of the Department of Resources and Development

Fiscal Year Ended March 31, 1950

Government services contributing to the development of Canada's natural resources have been expanded over the years to keep pace with the increasing requirements of industry and the public generally. This year it became apparent that the growth of these services had reached a point where a re-alignment of departmental functions and responsibilities was necessary.

The Department of Resources and Development is one of three departments which on January 18, 1950, emerged from the activities of the former Departments of Mines and Resources and Reconstruction and Supply. The other departments are Mines and Technical Surveys and Citizenship and Immigration. The Department of Resources and Development has administrative responsibility for all matters over which Parliament has jurisdiction relating to the forest resources of Canada, irrigation projects not assigned by law to any other department and water power development, National Parks, archaeology, ethnology, and fauna and flora, tourist information and services, housing, and the Trans-Canada Highway. The control and management of the affairs of the Northwest and Yukon Territories and other federally-owned lands are also responsibilities of the new Department.

This report contains summaries of the activities, during the fiscal year ended March 31, 1950, of those services which now comprise the Department of Resources and Development.

No natural resource is better adapted than forests to the detailed studies made possible by air photographs. The Forestry Branch has pioneered in this comparatively new field of research and practice. The development of technique has gone hand in hand with the forest mapping of nationally administered lands and other areas of direct concern to the Federal Government.

Research into basic properties of Canadian commercial woods, and studies with a view to more efficient and economic utilization of timber products, continue to occupy the attention and skills of scientists and technicians of the Forest Products Laboratories at Ottawa and Vancouver.

Marked advances have been made particularly in the field of education in the Northwest Territories. Scholarship awards and tuition grants have been instituted and a School of Opportunity has been established at Yellowknife where promising students from every community in the Mackenzie District may pursue higher studies. Manual training equipment and supplies have been provided to a number of schools.

The establishment of the Trans-Canada Highway moved much nearer accomplishment. Designed to provide a main artery of commerce across all ten provinces, uniform in design and quality of construction, such a road will be an important factor in Canada's defence arrangements. By encouraging tourist traffic between and through all the provinces it will contribute substantially to better national and international understanding. Road construction in Yukon Territory and in the National Parks constituted a major part of the Department's activities during the year.

Hydro-electric development throughout Canada proceeded actively. Installations completed in 1949 and plants under construction will add about 2,000,000 horse-power to Canada's developed capacity.

Special investigations were carried out during the year, including Columbia River surveys, problems involving prairie rivers, and the extension of activities to include Newfoundland.

Co-operation in matters of migratory birds conservation was continued between the Canadian Wildlife Division and provincial governments, game conservation societies and international organizations. Provisions of the Migratory Birds Convention Act were extended to Newfoundland.

A new high level of revenue from the tourist industry was reached in 1949. Inquiries received during this period increased eight-fold and approximately two million items of Travel Bureau literature were distributed.

The Department maintained its active participation in international affairs and was represented at various meetings of world significance. These included the Third Inter-American Conference on Tourism, the 7th Pacific Science Congress, the International Geographic Union Congress, the Third World Forestry Congress, the 4th Empire Mining and Metallurgical Congress, the 29th International Congress of Americanists and the United Nations Scientific Conference on Conservation and Utilization of Resources.

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

	Revenues		Expenditures	
	\$	c.	\$	c.
Administrative Offices.....			315,260	06
<i>Development Services Branch—</i>				
Branch Administration.....			89,382	08
Water Resources Division.....	246,982	31	898,501	44
National Museum of Canada.....	234	70	179,678	40
Northern Administrations.....	49,287	84 ¹	4,671,479	43
Lands Division.....	542,042	71 ²	285,815	67
National Parks and Historic Sites Division.....	605,719	76	10,498,216	23
Wildlife Division.....	102,034	20	233,771	37
Engineering and Construction Service.....	5,436	22	774,961	03
	1,551,737	74	17,631,805	65
<i>Forestry Branch—</i>				
Administration.....	148	11	57,435	94
Forest Research and Investigations.....	12,537	51	792,612	98
Forest Products Research.....	3,283	22	548,812	40
Grant to Canadian Forestry Association.....			4,000	00
Forest Insects Control Board.....			9,956	49
	15,968	84	1,412,817	81
<i>Special Projects Branch.....</i>	8,526	27	142,840	50
<i>Canadian Government Travel Bureau.....</i>			1,289,767	46
Totals for Department.....	1,576,232	85	20,792,491	48

NOTES—

¹ Amount received from profits on sale of liquor and from liquor fines in the Northwest Territories are not included. This revenue is deposited in a Special Account, designated Liquor Profits—Northwest Territories. The credit balance of that account at the close of the fiscal year was \$724,042.89.

² Includes \$19,579.64 to offset a similar amount of expenditure covering amounts written off during the year from outstanding advances for Seed Grain and Relief.

Development Services Branch

R. A. Gibson, Director

Departmental reorganization has substantially increased the responsibilities of this directorate which now embraces the services outlined below.

Development Services

WATER RESOURCES DIVISION—(Norman Marr, Chief)—assembles, analyses and makes available to federal, provincial, and municipal services, and to industry, reliable data about stream-flow and hydro developments, and advises on problems concerning international waters.

CANADIAN WILDLIFE DIVISION—(Dr. Harrison F. Lewis, Chief)—conducts research in wildlife problems and advises respecting administrative problems in wildlife management where the Federal Government has responsibility.

NATIONAL PARKS AND HISTORIC SITES DIVISION—(James Smart, Chief)—is responsible for the development and management of 26 national parks and national historic parks and the marking of historic sites.

NATIONAL MUSEUM OF CANADA—(Dr. F. J. Alcock, Chief Curator)—collects and displays national history material of scientific or economic interest and conducts research in natural science, publishing the results.

LANDS DIVISION—(G. E. B. Sinclair, Chief)—administers the lands and related resources of the Northwest Territories and Yukon and other federal lands which are not the responsibility of other government departments.

Northern Administrations

YUKON TERRITORY—Yukon Territory was created a separate territory in June 1898. Provision is made for a local government composed of a Chief Executive, styled Commissioner, also an elective Legislative Council of three members with a three-year tenure of office. The Commissioner administers the government under instructions from the Governor General in Council or the Minister of Resources and Development. The Yukon-Mackenzie River Division deals with all business which comes to the Minister from the Commissioner. 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 nature in the Territory.

NORTHWEST TERRITORIES—The Northwest Territories contain the mainland portion of Canada lying north of the 60th parallel of latitude between Hudson Bay on the east and Yukon Territory on the west, together with the islands lying between the mainland of Canada and the North Pole, including those in Hudson Bay, James Bay, and Hudson Strait. The total area of the Northwest Territories is 1,304,903 square miles, or more than one-third of the total area of Canada.

For administrative purposes the Territories were subdivided into the provisional districts of Mackenzie, Keewatin, and Franklin by Order in Council of March 16, 1918. The Northwest Territories are governed by the Commissioner, the Deputy Commissioner, and five Councillors appointed by the Governor General in Council. The Yukon-Mackenzie River Division deals with business arising from the government of the area in that federal constituency. The Arctic Division deals with the balance of the Northwest Territories. The Commissioner in Council has power to make ordinances for the government of the Territories under instructions from the Governor General in Council or the Minister of Resources and Development, subject to any Act of the Canadian Parliament applying to the Territories respecting such matters as direct taxation within the Territories in order to raise revenue, establishment and tenure of territorial offices, maintenance of municipal institutions, licences, solemnization of marriages, property and civil rights, administration of justice, education, public health, and generally all matters of a local nature.

The Yukon-Mackenzie River Division is headed by C. K. LeCapelain, and the Arctic Division by J. G. Wright.

Engineering and Construction Service

(C. V. F. Weir, Chief)—This service renders advisory and supervisory engineering and construction service to the various divisions of the Department of Resources and Development and to other departments which require it. The service consists of three main divisions: National Parks Engineering Division, Claude Maxwell, Chief Engineer; General Engineering Division, R. A. Campbell, Chief Engineer; and the Architectural Division, C. H. Buck, Chief Architect.

Review of Branch Activities

The Water Resources Division continued its systematic program of measuring and appraising water resources throughout Canada in co-operation with provincial authorities, and operations were extended to include the Province of Newfoundland. Fundamental to the effective and economic planning and development of all water resources projects, the data secured and made available by the division were of special significance in the great expansion taking place in hydro-electric undertakings in most parts of the country. Of major importance also was the work conducted by the division in connection with the solution of problems in international waters along the Canada-United States boundary, which were never more numerous, and which extended from Passamaquoddy Bay on the Atlantic seaboard in the east to the Columbia River basin in the west.

The Canadian Wildlife Division carried on scientific investigations of problems relating to the management of wildlife resources. Special studies included those of barren-ground caribou, wolves, beaver, muskrat, and migratory birds. The staff of this service was strengthened and its operations extended to Newfoundland. There is active co-operation with scientific services in the United States which are interested in wildlife problems, particularly migratory waterfowl.

Travel to Canada's National Parks eclipsed in volume all previous records. Visitors numbered 1,840,636, an increase over 1948-49 of 477,642. Appropriations for maintenance and new construction were the greatest in the annals of national parks administration and permitted the continuation of the broad program of highway construction and improvement inaugurated in 1948. Efforts to augment accommodation for park visitors were continued with considerable success and a wider use of facilities for camping and recreation was evident in all the national parks. Further progress was made in the development of Fundy National Park in New Brunswick, the latest addition to the system of national playgrounds. The official opening of Fundy Park is planned to take place in July, 1950.

On the recommendation of the Historic Sites and Monuments Board of Canada, 25 places of historic interest received recognition by the erection of monuments to which were affixed suitable plaques, or by affixing plaques to buildings. The most outstanding development in this field was the completion of the new wing to the museum at Fort Beauséjour National Park. It was named the John Clarence Webster Wing in honour of Dr. Webster who was chairman of the Historic Sites and Monuments Board of Canada until his death.

Reorganization of the department has associated the National Museum with the services which are engaged in the development of the renewable resources. In the past it functioned with the Geological Survey. More attention will be paid to wildlife studies, to the investigation of plant life in the Arctic, and to the consideration of the background of the people who have pioneered in Canada, including the collection and study of folk songs and folk lore. Material about native peoples assembled over the years is being prepared for publication. Scientists and educators are being assisted with information that is available nowhere else and considerable educational work is being carried on. The work of the museum has been hampered by insufficient trained staff. Steps are being taken to remedy this difficulty.

The Lands Division reports continuing interest in mineral production in the Northwest Territories. Active exploration for lead and zinc was carried on at Pine Point on the south shore of Great Slave Lake where three well-known companies have concessions. Expenditures to date greatly exceed those originally planned and results are very encouraging.

Eldorado Mining and Refining Limited continued to expand its operations at Great Bear Lake and the operating gold mines in the neighbourhood of Yellowknife increased their production. Discovery-Yellowknife, a new mine, came into production in February and one mine temporarily discontinued activity.

Because of the increased oil activity, particularly in Alberta, there was a demand for mineral rights under former Soldier Settlement lands in the Prairie Provinces and petroleum and natural gas rights have been disposed of in many cases under terms similar to those in effect under provincial regulations.

Provision of increased public services was the key-note of departmental activities in the Northwest Territories and Yukon Territory. Educational and welfare facilities were expanded and plans were made for further extensions during the coming year. School buildings were completed at Fort Resolution and Aklavik, and construction of a school at Coppermine was commenced. The administration continued to exercise the greatest care in its selection of welfare teachers for these

schools. Erection of buildings for a Northwest Territories welfare institute at Fort Smith was started in 1949. Installation of the all-year water and sewer systems at Yellowknife was completed. An all-year water supply system for Fort Smith and a summer system for Aklavik were planned. Efforts were made to improve transportation facilities. Roads were constructed and improved in and around settlements. Maintenance work was carried out on the Mackenzie Highway, and the winter road from Hay River to Yellowknife, which was begun in 1948, was improved in 1949. Accommodation for administrative staff in the Territories was improved, and 1949 witnessed the completion of an administration-apartment building at Aklavik, an apartment building at Fort Smith, four buildings for the department's representatives at Hay River, and a number of minor buildings. Survey work was continued in almost every field of scientific endeavour.

In the Yukon Territory, road construction work was continued as part of a long-term plan to improve transportation facilities. Construction of the centre section of the Whitehorse-Mayo-Dawson trail, from Carmacks to Mayo, into an all-weather road was all but completed in 1949. Surveys of the Whitehorse-Carmacks section were made preparatory to its construction in 1950. By the end of 1950 the rich silver-lead mining district of Mayo should have through access by road to the Alaska Highway at Whitehorse. Farther south, 58 miles of all-weather road were constructed with funds jointly provided by the British Columbia and Federal Governments to connect the gold mining district of Atlin, B.C., with the Alaska Highway at Mile 867.

Special health activities centred on a tubercular X-ray service which embraced all settlements along the Yukon and Stewart Rivers. Plans were laid for the incorporation of Whitehorse as a city. Other major activities were the development of the Tantalus Butte coal mine with federal assistance, hydro electric surveys, and improvements in the forest protection service.

Nineteen forty-nine may be regarded as a year of continuing progress in practically every phase of government activity in the Yukon-Mackenzie River area.

Considerable progress was made in extending educational facilities in the Arctic. Government day schools, staffed by welfare teachers who are responsible for welfare activities as well as education, were established at Lake Harbour on Baffin Island, Coral Harbour on Southampton Island, and Fort Chimo and Port Harrison, Quebec. A school which will be opened this autumn was built at Coppermine.

The present depressed price of fur, particularly white fox, has been a severe blow to the Eskimo economy. Studies are being undertaken with the object of improving and stabilizing the Eskimo economy by arranging for better utilization of all natural resources and development of new sources of income. This may involve some redistribution of the Eskimo population and also may direct their activities into new channels.

Thought has been given to the encouragement of handicrafts among the Eskimo as a means of supplementing native income. An agreement was concluded with the Canadian Handicrafts Guild whereby the Guild, with financial assistance from the Administration, is to provide training for the improvement of native types of handicraft, to promote and organize this activity, and to arrange for the sale of the products.

Owing to the depletion of wildlife in certain areas and low fur prices, there has been an increasing need to issue relief to Eskimos. Epidemics such as the poliomyelitis epidemic in the Chesterfield area have also involved problems in the rehabilitation of the victims and the care of their families.

The program of construction activities planned and executed by the Engineering and Construction Service totalled \$8,990,057.31, an increase of 51 per cent over 1948-49. That year had been more extensive and varied than any year preceding it.

Of this expenditure, \$6,067,013.86 was allocated to the development of national parks, \$2,060,789.56 to the Yukon and Northwest Territories, \$506,927.89 to Indian reserves, \$2,326 to the Royal Canadian Mounted Police, \$48,000 to the Grimshaw-Great Slave Lake Highway, and \$305,000 to the Cranberry Portage-Cuprus Mines Road.

By objects this expenditure was classified: roads and bridges, \$7,156,043.84; buildings, \$1,355,103.68; water supply and sewage disposal, \$422,340.55; and other public utilities, \$56,569.24.

There were important changes in the organization of the division. Senior officers who had completed their period of duty have retired and replacements have been effected. Competition for the services of competent, reliable, and experienced engineers is very keen. Engineers in charge of construction activities are called upon to bear considerable responsibility and, to be able to recruit and retain men of this calibre, it should be possible to offer permanent employment and salary rates that would bear comparison with what is paid for similar responsibility in Provincial Government services and in private industry. The activities of this unit are of great importance from the development standpoint, extending from Cape Breton Highlands National Park in Nova Scotia to the Yukon Territory.

Development Services

Water Resources Division

The primary function of the division is the acquisition, analysis, and publication of stream-flow and run-off data covering the whole of Canada. These basic data are used in connection with power development, storage, irrigation, drainage, flood warnings, flood control, fisheries research, navigation, domestic water supply, and various international water problems. The division acts as the central repository for hydro-metric and water-power information acquired from all available sources; it maintains gauging stations and carries out hydrometric investigations in the provinces in accordance with co-operative agreements under which provincial authorities contribute funds towards the cost. Administration of the Dominion Water-Power Regulations in the Yukon and Northwest Territories and on federal lands is a further responsibility. The division is actively concerned with international waterway problems; its engineers serve on numerous boards and engineering committees and act as technical advisers to the Department of External Affairs and to the International Joint Commission; special investigations and studies are carried

out by the staff of the division as required. Engineering assistance and advice are supplied to federal agencies, particularly on hydraulic problems.

The division's activities are largely co-ordinated with those of other organizations, both public and private, that are interested in the use of water resources. Close co-operation is maintained with federal, provincial, and municipal authorities with respect to power and water-supply problems. Stream-flow data are furnished to many private companies, which frequently reciprocate by supplying the division with gauge records and with assistance in securing data of mutual interest. Cordial relations also are maintained 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.

Owing to the urgent requirements of special investigations carried out during the year, particularly the Columbia River surveys, problems involving prairie rivers, and to the extension of activities to include Newfoundland, the staff of the division was busy throughout the year. Hydro-electric development throughout Canada proceeded actively. Newly installed capacity coming into operation in 1949 totalled 480,565 horse-power and plants under construction will have an ultimate capacity of about 1,500,000 horse-power.

Hydrometric Service

For the purpose of facilitating hydrometric field operations, district offices are maintained in Vancouver, Calgary, Winnipeg, Ottawa, Montreal, and Halifax and sub-offices at Kamloops, Nelson, Cranbrook, Whitehorse, Keewatin, Fort Frances, North Bay, Niagara Falls, and St. John's.

Stream Gauging

Hydrometric field operations were maintained at a high level owing to the continuing demand for run-off data, particularly on international rivers. More than 1,000 gauging stations were maintained, many of them continuously by use of recording gauges. During the open-water season, about 400 part-time observers were employed by the division as gauge readers and of these some 275 served throughout the year; about an equal number of gauge readers who report to the division were paid by various co-operating agencies. Approximately 3,586 stream-discharge measurements and 1,172 inspections of gauging stations were made by the technical field staff.

Field operations in British Columbia and the Yukon are directed from the district office in Vancouver and sub-offices for hydrometric work are maintained at Kamloops, Nelson, Cranbrook, and Whitehorse. A total of 369 gauging stations were in operation and of these 193 were all-year stations. Five stations are located in the Yukon Territory. The purposes served by gauging stations include power, irrigation, water supply, fisheries, flood warnings, navigation, and international problems. Close liaison is maintained with the Water Rights Branch of the British Columbia Department of Lands and Forests and co-operation is given to a large number of federal, provincial, municipal, and private agencies. Special hydrometric programs were carried out in connection with the Columbia River investigations, Fraser River studies, power investigations by the Aluminum Company of Canada, and fisheries research.

The Calgary office maintained 203 gauging stations of which 47 were in continuous operation throughout the year and the remainder for the open-water season. Six stream-gauging stations in connection

with power development and six water-level gauges for navigation purposes are located in the Northwest Territories. A considerable part of field operations is concerned with international rivers on which 53 co-operative international gauging stations and 27 semi-international stations are maintained. Studies in connection with the Waterton and Belly Rivers required considerable field and office work. Close co-operation was given to the Prairie Farm Rehabilitation Administration in securing and supplying hydrometric data for irrigation studies and to Calgary Power Limited on storage and power studies in the Bow River basin.

The territory covered from the Winnipeg district office includes eastern Saskatchewan, Manitoba, and northwestern Ontario, throughout which 134 gauging stations are distributed. Co-operation is received from the Manitoba Government and stations in the northern part of the province are visited by means of an aeroplane supplied by the province. Regulation of the lakes in the Winnipeg River basin is a continuing function, sub-offices being maintained at Keewatin and Fort Frances; supervision is exercised over the Ogoki and Long Lac diversions by the Ontario Hydro-Electric Power Commission. Surveys and inspections were made in connection with the excavation of a new channel at the Dalles Rapids on the Winnipeg River. Special studies were carried out on international prairie rivers.

The Ontario district office, with headquarters at Ottawa and sub-offices at North Bay and Niagara Falls, maintains 141 gauging stations of which 71 are primarily in the interests of power development and the remainder jointly for power, flood control, and navigation. Close co-operation was maintained with the Hydro-Electric Power Commission of Ontario, the Ontario Department of Planning and Development, and the Grand River Conservation Commission. Special attention was given to the Thames, Grand and South Nation Rivers during spring floods and studies were continued on the Niagara River covering proposed new diversions. Co-operation was given the Department of Public Works regarding the flow of the Ottawa River and tributaries.

The Quebec district office at Montreal is closely associated with the Quebec Streams Commission and co-operates in its investigations. Co-operation is also maintained with the power-producing agencies of the province including the Quebec Hydro-Electric Commission, the Shawinigan Water and Power Company, the Aluminum Company of Canada, and the Gatineau Power Company. A total of 159 gauging stations were in operation during the year, of which 111 were all-year stations; the majority of stations are for power purposes. Special work included the rating of the outflow of storage reservoirs and the checking of power-station ratings.

The activities of the Halifax office were extended to include Newfoundland and a sub-office was established at St. John's. The collection and analysis of available hydrometric data is proceeding and a beginning was made on a field program to include the Hamilton River in Labrador. The district covers the Maritime Provinces and co-operation is received from the Nova Scotia Power Commission and the New Brunswick Electric Power Commission as well as from private power companies. Twenty-five gauging stations were maintained, 15 in Nova Scotia, seven in New Brunswick and three in Newfoundland. Special studies and investigations were made in connection with tidal power schemes. On behalf of the New Brunswick Resources Development Board, studies were made of power sites on the Shogomoc, Tetagouche, and Magaguadavic Rivers.

Run-off Conditions in Canada

For Canada as a whole, while extreme variations were experienced in some areas at certain seasons, total run-off for the year was somewhat below normal. The average for 23 rivers distributed across the country was 93 per cent of the long-term mean. In British Columbia, run-off for the year was slightly below normal in the southern and central parts and slightly above normal in the north and on Vancouver Island. Following low flows in January and February, the Skeena River recorded a new high mean discharge for March. In Alberta, the total flow of mountainous streams was well below normal, averaging 75 per cent of the long-term average. New low mean-monthly discharges were recorded for June, July, and August on the Bow River at Banff. Conditions improved in the autumn and winter but flows were not sufficient to replenish storage reservoirs. Flows of prairie rivers in general were close to normal, with that of the Red River being well in excess of average. Run-off recorded on Ontario rivers averaged close to normal. Low flows were experienced in the north-central parts in summer and autumn, with a new low for September on the North Magnetawan and for November on the Ausable. The Saugeen River set a new low record in August and a new high in December. In Quebec, the run-off was deficient over the northern and southern parts, with the more critical conditions obtaining in the St. François River basin; in the east and northwest, run-off was more favourable. In the Maritime Provinces, stream flows were slightly sub-normal; low flows during the summer were largely restored during the autumn and winter. In Newfoundland only partial records were secured, the hydrometric program being in the process of organization.

Snow and Glacier Surveys

For the purpose of estimating the amount of spring run-off which will result from the accumulated snow in certain important drainage basins, annual snow surveys to determine the amount of water content in the snow cover are made on selected typical courses in these areas. The monthly date of each individual 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 division 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 this year showed 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 also makes an independent survey in the Bow River basin in late March. In the latter area, 1950 snow cover was nearly twice the amount of yearly average. In the Winnipeg River watershed, the division 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. The 1950 results indicated that the amount of snow present was 30 per cent above normal. Seven surveys in the northern sector of central Ontario and two surveys in the Rideau River system showed that snow cover in these areas averaged 60 and 65 per cent of normal, respectively. In the Maritimes, three regular surveys are made in New Brunswick and others are made in Nova Scotia in years when snow cover exists.

The glacier observations, initiated in 1945 in connection with studies of the water resources of the mountainous regions, were continued in 1949. Six glaciers were under study in British Columbia and five in Alberta. Further recessions of the tongues of all glaciers was reported, these averaging 57 feet in the Coast Range, 56 feet in the Selkirks, and 123 feet in the Rocky Mountain Range. In the Coast Range, two observations of the yearly rate of ice flow averaged 18 feet, while the average rate for four glaciers in the Rocky Mountain Range was 48 feet. The estimated glacier run-off at the time of survey varied from 10 to 75 second-feet. More precise records became available for the run-off from the typical Athabasca Glacier as a new gauging station, equipped with a recording gauge, was in operation during the summer on the Sunwapta River. This station showed an average run-off of 119 second-feet for four months.

Flood Warning Service

As the observation of river levels is a continuous function of the division, a flood-warning service is provided as required on certain rivers subject to dangerous flooding. On the Fraser and Columbia Rivers a particularly valuable service is rendered by the Vancouver office in predicting river levels. A similar service is given in Ontario and Manitoba by the Winnipeg office at the time of spring floods in the Winnipeg River watershed.

Current-Meter Rating and Experimental Station

A specially constructed and fully equipped station for the calibration of current meters and for carrying out tests and experiments in connection with stream-gauging apparatus is maintained at Calgary. Meters are rated for many organizations, as well as for the district offices of the division, and much experimental work is carried out. The station operated from May 12 to October 15, 68 meters being rated for the division and 17 for other agencies; 51 meters were overhauled and repaired.

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 by the division, an engineer being stationed at Keewatin. The spring run-off of the watershed was below normal but the total yearly run-off was 107 per cent of the long-term mean; monthly variations from the long-term mean were not extreme but August was a moderately high month while September was low. The lake level rose from elevation 1,057.65 feet on April 1, 1949, to a peak of 1,060.49 feet on August 22 and was drawn down to elevation 1,059.41 on March 31, 1950. The discharge from the lake was regulated to supply the equitable requirements of the power plants at the lake outlets and on the Winnipeg River in Manitoba.

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 was about normal, averaging 104 per cent of the long-term mean. The summer and early autumn run-off was below normal, with September being the low month; conditions improved in October. The lake level, which was

at elevation 1,165.42 on April 1, 1949 rose to a peak of 1,168.61 by August 23; the use of storage gradually lowered the lake and by March 31, 1950, the level was 1,166.50, about normal storage level. The full requirements of the Ear Falls power plant were maintained throughout the year but only small amounts of water were released for other reasons.

Under authority of Order in Council P.C. 5081 of November 5, 1948, the responsibility for the regulation of Rainy and Namakan Lakes was transferred from the Department of Public Works to the Department of Mines and Resources. This duty was assumed by the division on April 1, 1949, when an engineer was stationed at Fort Frances for the purpose of carrying out the instructions of the International Rainy Lake Board of Control. This sub-office is under the jurisdiction of the District Engineer at Winnipeg. As of June 8, 1949, an order prescribing the method of regulating the levels of these lakes was issued by the International Joint Commission; as inflow to the lakes was above normal during the greater part of the year, the application of this rule-curve resulted in slightly above normal storage levels at the end of March.

The Water-Power Resources of Canada

From the stream-flow records acquired as a result of the division's hydrometric investigations, and from all data accumulated from other sources, revisions are made from time to time in estimates of water-power resources of Canada. The current estimate, which now includes Newfoundland, shows resources of 42,899,000 horse-power at ordinary six-months flow, which will allow an economic installation of about 55,000,000 horse power; on the basis of ordinary minimum flow, the estimate is 26,914,500 horse-power. During 1949 new hydraulic installations totalled 480,565 horse-power, bringing the installed capacity of all water-power plants in Canada to 11,613,333 horse-power; of this capacity, central electric stations comprise over 90 per cent. The current water-power situation in Canada was discussed in the division's annual bulletin, *Water Power Resources of Canada*, issued under date of March 15, 1950.

Water Resources Monthly Review

The division co-operates with the United States Geological Survey by supplying data for the monthly summary, issued by the latter body, of general stream-flow conditions in the United States and Canada. The flow records of 22 typical rivers, well distributed across Canada, are computed immediately at the month's end, 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 and in some instances is broadcast by radio; semi-annual and annual summaries also are issued. The information is of great value in all matters connected with run-off.

International Waterway Problems

In connection with 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 Water Resources Division 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 Chief of the Division, continued the studies of the water resources of the Columbia River basin in Canada and consulted with similarly functioning United States bodies in the planning of the most advantageous joint utilization of these resources. The investigations are being conducted from the view-points of irrigation, water power, flood control, reclamation, navigation, domestic water supply, sanitation, conservation of fish and wildlife, and of other beneficial purposes.

A considerable part of the extensive field investigations in the Columbia River basin, initiated by the Canadian Section of the International Columbia River Engineering Board, was carried out directly by the staff of the Vancouver office of the division, a sub-office being maintained at Canal Flats. Three field parties were engaged on reconnaissance river surveys in connection with possible storage reservoirs on the upper tributaries of the Columbia and Kootenay Rivers and on topographic surveys of dam sites. Drilling operations, in connection with sub-surface investigations of foundation conditions at three dam-site locations, were conducted by the division, in part by contract. Seismic surveys were carried out at seven locations. Preliminary designs and cost estimates covering a dam and power-plant layout at the Plumbob site on the Kootenay River were obtained. Additional stream-gauging stations were established, recording-gauges installed, and wells built for ground-water studies; river cross-sections and water levels were taken for back-water studies. The preparation of maps and plans entailed a great amount of work in the drafting section. All work was co-ordinated with that of other agencies co-operating in the over-all study including: Legal and Map Surveys with four parties in the field; the Geological Survey conducting geological, ground-water, and river-silt studies; the Department of Public Works making bathymetric surveys in Columbia River and the Arrow Lakes; and the Provincial Department of Agriculture making soil surveys, sub-surface flowage appraisals, and land-utilization studies.

Osoyoos Lake

The International Control Board, of which an engineer of the division is a member, continued to exercise control over the operation of the Zosel Dam at Oroville, Washington. Several inspections of lake and river conditions were made by engineers of the Vancouver office.

Kootenay Lake

This International Control Board, with Canadian representation drawn from the division, continued its supervision of the storage and flood control requirements attached to the International Joint Commission's approval of the operation of Corra Linn dam. Other related matters were active and required engineering attention and reports by division officials. Action was continued in connection with applications for increased storage on the lake and for reclamation on Kootenay Flats, and the commission approved the Canadian proposals in these respects.

Waterton-Belly Rivers Engineering Board

This International Board was appointed by the commission in April 1948 for the purpose of advising 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.

The board and its field organizations were very actively engaged with the collection and analysis of basic data and in the preparation of a report for submission to the commission at its April 1950 meeting. Two members of the Water Resources Division serve on the board and field operations were carried out by the staff of the Calgary office.

St. Mary and Milk Rivers

Extensive studies, concerned with the division for irrigation purposes of the waters of these international streams, were continued throughout the year. Forty-one international gauging stations were jointly maintained by the Calgary office and the United States Geological Survey. Close supervision was exercised on the amounts of water released from storage and on the diversions by each country.

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 division. The required studies are concerned with the mutual economic utilization of the water resources of the Souris, Red, and Roseau Rivers. During the year the board was active in directing field operations and the Winnipeg office of the division made substantial contributions to the field studies and to the preparation of preliminary plans and reports on water uses in the basin.

Niagara River

The Chief of the Division, acting in an advisory capacity to the Department of External Affairs, attended meetings in Ottawa in October and November and in Washington in December, concerned with the diversion of water from the Niagara River for power purposes. As a result of these negotiations, the Niagara Diversion Treaty, revising Article V of the Boundary Waters Treaty of 1909, was signed at Washington on February 27.

Water-level and discharge studies of the Niagara River were continued throughout the year, an engineer of the Water Resources Division being stationed at Niagara Falls.

Passamaquoddy Tidal Power

The International Passamaquoddy Engineering Board was appointed by the commission in January 1949 for the purpose of ascertaining the costs of engineering studies necessary to determine the feasibility of the international Passamaquoddy tidal power development. The Chief of the Division served as Canadian Chairman of the board in 1949-50, and the staff of the Halifax office was utilized to develop data and analyses for the board. As a result of considerable field and office work, the board was able to complete its report to the commission in March 1950.

Other Boards

Other international boards, on which division officials serve and which operated in a routine manner during the year, include those relating to Sage Creek, Souris River, Lake of the Woods, Rainy Lake, Prairie Portage, Lake Superior, Niagara River, Massena, Lake Champlain, Lake Memphremagog, and St. Croix River.

Special Boards and Projects

Snare River Power Project

On behalf of the Northwest Territories Power Commission, an investigation of the discharge conditions of the overflow channel and of the spillway dam of the Snare River Power Project was made during June 1949. A detailed report was prepared which was transmitted to the commission.

St. Lawrence Waterway

The Chief of the Division served as a member of the main and two sub-committees of the Interdepartmental Committee on the St. Lawrence Waterway.

Prairie Provinces Water Board

The Chief of the Division acts as one of the two Canadian representatives on this board which was organized to study the interprovincial waterways problems of the three Prairie Provinces. Meetings which were held at Regina in May and in Winnipeg in January were attended also by the district engineers from Calgary and Winnipeg.

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 1948, the District Engineer at Vancouver being a member. To provide essential discharge data for the studies being undertaken, two major gauging stations were constructed by the division and a third is under construction.

Okanagan Flood Control

The District Engineer at Vancouver is a member of the Joint Board of Engineers which was set up in 1942 to study the Okanagan River system and devise flood control works. The recommendations of the board were being carried out during the year by federal and provincial agencies.

Technical Assistance to Federal Agencies

The western district offices of the Water Resources Division carry out important administrative, engineering, and construction functions on behalf of other 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. Satisfactory conferences in regard to matters affecting Indian interests were held with the Comptroller of Water Rights. Direct assistance was given in planning and carrying out a number of projects on Indian reserves.

Engineering and Construction Division

On behalf of this agency, a considerable amount of engineering work was carried out on Indian reserves by the western district offices. Inspections and surveys were made, reports and plans prepared, and supervision of construction exercised on projects involving irrigation and drainage problems, domestic water supply, sanitation, erosion, roads, wharves, electric lighting, and building repairs. The Vancouver office was concerned with projects on some 50 reserves in British Columbia and the Yukon. The cost of work carried out under the supervision of the division amounted to about \$142,000. The Winnipeg office was engaged in the supervision of the construction of three schools, on six projects involving building repairs, and on two surveys concerned with roads and sewage disposal. Following the reorganization of the Department, this phase of activity ceased to be a responsibility of the division.

Other Agencies

The Department of Public Works received assistance in the major hydraulic problems involved in the development and maintenance of ship channels in the Fraser River and on other matters. The division's Vancouver office acted in British Columbia on behalf of the Dominion Lands Agent in the administration of federal lands. Co-operative hydro-metric programs with the Pacific Biological Station, Fisheries Research Board of Canada and the International Pacific Salmon Fisheries Commission were continued. Close co-operation in hydrometric matters was maintained with the Department of Agriculture in its irrigation work in Alberta and Saskatchewan by the Prairie Farm Rehabilitation Administration.

Water Power Administration

In its function as administrator of the Dominion Water Power Regulations, the division was concerned with the following projects.

Yukon Electrical Company, Limited

Under Interim Licence dated July 1, 1949, this company proceeded with the construction of a 400-horsepower development on Porter Creek about seven miles northwest of Whitehorse, Yukon Territory. Good progress was made on the initial development and the plant was opened in November. However, because of erosion of ditches and water losses, it was forced to close down in January. Further construction and possibly a change in plans will be necessary during the open season of 1950. Inspections of the project have been made at intervals by the division engineer stationed at Whitehorse. For the calendar year 1949, rental received amounted to \$43.33.

Lake Minnewanka—Cascade Development

A final licence for this development in Banff National Park by Calgary Power Limited was issued on May 14, 1947, but certain phases of operation come under inspection by the division. Owing to the low rate of discharge by Bow River tributaries during the summer of 1949, and to a high autumn power demand on the Cascade plant, by late January Lake Minnewanka reached ordinary-low regulated level but, by special departmental authorization, further withdrawals of water were allowed until the lake reached emergency-minimum level in late March. The power plant operated at a yearly average rate of 57.1 per cent of capacity. Rental of \$9,441.27 was received covering 1949 operation.

Ghost Development—Bow River

Under the terms of the final licence for this development dated May 14, 1947, one-half the annual rental is paid to the Federal Government, through the division, for the benefit of the Indians of the Stony Band. For the calendar year 1949, rental was computed at \$18,625.28, and \$9,312.64 was received from Calgary Power Limited for transmittal to the Indian Affairs Branch.

Yellowknife River Plant

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 22,067,400 kilowatt-hours in the calendar year 1949, as compared with 23,124,300 kilowatt-hours in 1948. The rental received for 1949 amounted to \$2,813.30.

Publications and Articles

The publication of *Water Resources Papers*, giving current hydro-metric and run-off data for specified drainage basins, is a continuing function of the division. Recent papers cover the four main drainage divisions of Canada: Pacific; Arctic and Western Hudson Bay; St. Lawrence and Southern Hudson Bay; Atlantic. The present practice is to cover two or more climatic years in one volume.

Three of these papers were issued during the year: No. 95, *St. Lawrence and Southern Hudson Bay Drainage, 1943-44 and 1944-45*; No. 97, *Arctic and Western Hudson Bay Drainage, 1943-44 and 1944-45*; and No. 100, *Atlantic Drainage, 1944-45 and 1945-46*. Mimeographed bulletins *Hydro-Electric Progress in Canada* and *Water Power Resources of Canada* are issued annually in English and French. The present demand is for about 1,000 copies of each.

A paper *The Role of Water Power in the Mining Industry of Canada* was presented at the annual meeting in April of the Canadian Institute of Mining and Metallurgy and was printed in the June issue of the Institute's Bulletin. A paper *Energy Resources of Canada and Their Development* was prepared for the Fourth World Power Conference, London, 1950. Revisions were made of water-power articles for *Canada 1949*, *Canada Year Book, 1948-49*, and *Heaton's Handbook*. Other short articles were prepared for various purposes.

Revenue

The various provinces contributed \$38,125 in support of co-operative water-resources studies: \$98,073.18 was received from the Province of Manitoba in connection with capital and operating costs of Lake of the Woods and Lac Seul storages as provided in the Natural Resources Transfer Agreement: \$12,397.90 was revenue secured from water-power licences; miscellaneous revenue brought the total to approximately \$148,625.

Canadian Wildlife Division

The Canadian Wildlife Division deals with wildlife matters coming within the jurisdiction of the Federal Government of Canada. Its functions include conservation and management of wildlife in the Northwest Territories; advising and co-operating with the National Parks and Historic Sites Division regarding fish and wildlife problems in the National Parks of Canada; administration of the Migratory Birds Convention Act (in conjunction with the Royal Canadian Mounted Police and in co-operation with the provincial game authorities), the Northwest Game Ordinance, and the Fur Export Ordinance; and co-ordination and advice in connection with the administration of the Game Export Act by the provinces. The Wildlife Division also handles national and international problems relating to Canada's wildlife resources, and co-operates with government and other agencies having similar interests and problems in Canada and elsewhere.

During the period under review, Dr. Harrison F. Lewis, the Chief of the Division, visited the north shore of the Gulf of St. Lawrence to examine applicants for the position of regional supervisory officer, went to Newfoundland to set up an office of the service there, and examined the United States Migratory Bird Refuge at Bear River, Utah. He visited the offices of the division in the four Western Provinces and the Maritime Provinces, examined Fundy National Park, addressed the University of Alberta Short Course in Forest Conservation and Wildlife Management at Banff, and attended and addressed the following meetings outside of Ottawa: annual meeting of the International Association of Game, Fish and Conservation Commissioners at Winnipeg in September; annual meeting of the National Audubon Society at Detroit in October; annual meeting of Air Industries and Transport Association of Canada at St. Jovite, Quebec, in October; annual convention of the Quebec Federation of Fish and Game Associations at Montreal in November; annual convention of the Ontario Federation of Anglers and Hunters at Sudbury in January; annual convention of the Saskatchewan Fish and Game League at Regina in February; and the Fifteenth North American Wildlife Conference at San Francisco in March.

At the annual meeting of the International Association of Game, Fish and Conservation Commissioners at Winnipeg in September, Dr. Lewis was elected president.

The division was represented at the United Nations Scientific Conference on the Conservation and Utilization of Resources at Lake Success, New York, in August and September, by H. D. Fisher, a former officer of the division who is now on the staff of the Fisheries Research Board.

In addition to having scientific, administrative and clerical staff in Ottawa, the division was represented during 1949-50 by seven Dominion Wildlife Officers resident in and responsible for their respective districts. These districts are: Newfoundland; the Maritime Provinces; Quebec; Ontario; Manitoba and Saskatchewan; Alberta; the Yukon and Northwest Territories; and British Columbia. The first-mentioned of these districts was established in 1949, and the first Dominion Wildlife Officer for Newfoundland, Leslie M. Tuck, was appointed on October 1.

Offices of the division permanently engaged in scientific research in the field include two mammalogists, one at Fort Smith, N.W.T., and one at Aklavik, N.W.T.; and four Wildlife Management Officers, with headquarters respectively in Vancouver, Saskatoon, Ottawa, and Sackville, New Brunswick. The positions at Saskatoon and Ottawa were established during 1949.

Under the Migratory Birds Convention Act, the Canadian Wildlife Division is responsible for the establishment and administration of bird sanctuaries. There are now 76 of these sanctuaries, some of which 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, and in certain other remote situations where special protection of migratory birds is required. Many game officers are appointed without salary to assist the Wildlife Division in administration of the Migratory Birds Convention Act.

During the period under review, 20 scientific articles on wildlife subjects, written by officers of the service, appeared in various publications. A film, *Birds of the Seashore*, was produced by the National Film Board under the technical supervision of the service.

Field Investigations

Biological Surveys

Captain A. W. F. Banfield, chief mammalogist, carried on field studies of the status of the barren-ground caribou. In April and early May he made an extensive aerial survey of caribou herds from bases at Yellowknife and Reliance, N.W.T. From June 25 to July 11 he investigated vegetation on the winter ranges near Reliance and along the Lockhart River. He spent the rest of July at Bathurst Inlet, collecting information about the utilization of caribou by the Eskimos and about caribou on the fawning grounds. In August he studied Eskimo hunting techniques and utilization of migrating caribou at Contwayto Lake. He was granted leave of absence from September 15 to engage in post-graduate studies at the University of Michigan.

J. P. Kelsall, mammalogist for the Districts of Franklin and Keewatin, N.W.T., made an aerial survey of the caribou situation on Baffin Island in April. About 3,000 miles were flown over Baffin Island during this investigation. In August and September, he observed wildlife conditions and management methods in the Mackenzie Delta, and the muskrat studies of C. E. Law, student assistant, in the Slave River Delta; made two aerial surveys (covering 2,500 miles) of beaver in the Northwest Territories east and west of Wood Buffalo Park; and made several local game patrols and surveys, based on Fort Smith, N.W.T. In October and early November he made mammalogical investigations (particularly with

regard to elk) in Elk Island, Jasper, Banff, Waterton Lakes and Riding Mountain National Parks. In the latter part of November and again in March, he studied, and made recommendations regarding, an over-population of deer on Beausoleil Island in Georgian Bay Islands National Park. During February, he made aerial surveys of caribou north and northwest of Churchill, Manitoba.

W. E. Stevens, mammalogist, completed a year of university studies and returned to duty at Aklavik, N.W.T. on June 13. His biological investigations included studies of muskrats in Mackenzie Delta and of beaver and marten in the northern part of Mackenzie District, in which he was assisted during the summer months by student assistant D. R. Flook. In October and November he investigated caribou migrations and the utilization of caribou in the area west of Aklavik. From December 16 to January 30 he was at Fort Smith to observe and assist with the annual take of buffalo to meet the needs of Indians.

W. A. Fuller, mammalogist stationed at Fort Smith, continued investigations of the status of muskrat, beaver, and bison in Wood Buffalo Park. He was granted leave of absence from July 1 to engage in post-graduate studies at the University of Wisconsin. During the summer C. E. Law, student assistant, was stationed at Fort Smith and Fort Resolution and began a study of the ecology of the muskrat in the delta of the Slave River. He also supervised the transfer of 56 beaver from Prince Albert National Park to Wood Buffalo Park.

A. H. Lawrie and D. Peterson, student assistants, carried out investigations of the barren-ground caribou in Northern Manitoba and Keewatin District, N.W.T.

W. W. H. Gunn was employed temporarily by the Wildlife Division to accompany the Joint Arctic Weather Station Re-supply Mission as an official wildlife observer. He obtained valuable records, photographs, and films of wildlife in the Eastern Arctic.

Dr. Jean-Louis Tremblay of the Faculty of Sciences, Laval University, carried out for the department an investigation of wildlife resources along the east coast of Hudson Bay from June 30 to August 23.

Mammals in Parks

Seventy beaver were live-trapped in Prince Albert National Park, and 56 of these were transferred by aeroplane to Wood Buffalo National Park. The other 14 were transferred by railway to Riding Mountain National Park.

Fifty elk were live-trapped in Elk Island National Park. Twenty-five of these were shipped by truck, rail, and boat to Wood Buffalo National Park and released at the junction of Birch River and Moderre Creek. The other 25 were shipped to the Lardeau District, British Columbia, where they were released. One live buffalo bull was shipped by truck from Elk Island National Park to Prince Albert National Park.

The following shipments of live animals to zoological gardens were made: one pair of elk and one pair of buffalo from Elk Island National Park to the Auckland Zoo, New Zealand; and one Rocky Mountain ram and two Rocky Mountain ewes from Jasper National Park to the Quebec Zoological Garden, Charlesbourg, Quebec.

In order to preserve the range in Banff National Park, the reduction of the elk herd there has been continued. Three buffalo were slaughtered in Prince Albert National Park in order to keep the number of buffalo

within the grazing capacity of the enclosure. The meat of the elk and buffalo slaughtered was given to the Indian Affairs Branch, Department of Citizenship and Immigration, for distribution to needy Indians.

Twelve buffalo were slaughtered in Elk Island National Park to provide meat for Indians.

Statement of Large Mammals in Fenced Enclosures in National Parks, March 31, 1950

Species	Banff Park Paddock	Elk Island Park	Prince Albert Park Paddock	Riding Mountain Park Paddock	Total
Buffalo.....	14	974	9	53	1,050
Elk.....		588		163	751
Moose.....		355			355
Mule deer.....		96			96
White-tailed deer.....				20	20
Total.....	14	2,013	9	236	2,272

Fishing and Fisheries Management in National Parks

J. P. Cuerrier, formerly Associate Professor of Biology at the University of Montreal, was appointed limnologist on June 30, and chief limnologist on February 3. Dr. V. E. F. Solman was appointed chief biologist on June 1.

The Limnology Section of the Wildlife Division participated in revising Anglers Guides and Fishing Regulations for the national parks and in issuing netting licences in national parks. It furnished advice regarding the operations of the three national park fish hatcheries. It carried on limnological and fisheries investigations in Riding Mountain, Prince Albert, Jasper, Yoho, and Banff National Parks. R. D. Harris, graduate student at the University of British Columbia, was employed as a summer assistant and took part in these investigations.

Voluntary completion of creel census cards by anglers visiting national parks recorded data on a total catch of 33,682 fish, taken by 13,621 reporting anglers from 119 lakes and 79 streams in 11 national parks. A total of 61,455 hours of effort were devoted to angling by anglers who completed cards. Reports on the creel census analysis were distributed to about 1,500 persons 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 and adjacent waters, in Wood Buffalo National Park, Alberta, on terms prescribed by the Minister. Approximately 121,108 pounds of fish, including 117,930 pounds of goldeye, were purchased from the resident Indians who carried on fishing operations under this licence from June 1 to July 31. Revenue collected on fish removed from the park by the licensee was \$1,203.13.

A netting licence issued to A. Pease, Prince Albert National Park, authorized him to take whitefish from Waskesiu Lake from June 1 to September 30, and to sell them to residents and tourists in the park.

Netting licences were issued without charge to 16 residents of Jasper National Park to take whitefish for personal use in Talbot Lake during the period January 1 to March 31.

A shipment of 9,000 eastern brook trout fingerlings was made by truck from Jasper hatchery to Edmonton and thence by aeroplane to Fort Smith, N.W.T. The fish were liberated in Pine and Seven Mile Lakes, in Wood Buffalo National Park.

A total of 253,506 fish from park hatcheries, including rainbow, eastern brook, cutthroat, and brown trout, were distributed in national park waters. More than 17 per cent of the fish stocked were yearlings or larger fish. In order to study the survival of fish raised in hatcheries and distributed in park waters, more than 17,051 were tagged or marked before being released.

Details regarding the distribution of hatchery products appear in the following table.

**Numbers of Eyed Eggs, Fingerlings and Adult Trout
Distributed in National Park Waters During 1949**

	Rainbow Trout			Eastern Brook Trout		Cutthroat Trout		Brown Trout	Total
	Finger-lings	Year-lings	Adults	Finger-lings	1 to 2 years old	Eyed Eggs	Finger-lings	Finger-lings	
Banff.....	26,000	12,450	110			20,000	98,000		156,560
Glacier.....				400					400
Jasper.....	12,622	4,000		500	3,329			2,500	22,951
Kootenay.....				1,500		5,000			6,500
Waterton Lakes.....	6,000	22,595		20,000					48,595
Wood Buffalo.....				9,000					9,000
Yoho.....	4,000	1,500					4,000		9,500
Total.....	48,622	40,545	110	31,400	3,329	25,000	102,000	2,500	253,506

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 an Act of Parliament known as the Migratory Birds Convention Act, provides protection for many valuable birds that migrate between Canada and the United States. In this conservation measure the Federal Government and the provinces co-operate. Regulations in accordance with the statute are agreed upon by the Federal and Provincial Governments before being adopted by Federal 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.

The provisions of the Migratory Birds Convention Act were extended to Newfoundland on April 1, 1949. The resulting problems of adjustment were considered by the conference of Provincial and Dominion Wildlife Officials at Ottawa in June and were handled co-operatively by the Wildlife Service and the Newfoundland authorities. It was recognized that, in the economy of Newfoundland, migratory birds were of particular importance.

Field administration of the Migratory Birds Convention Act was continued under the supervision of dominion wildlife officers, and was initiated in Newfoundland, where Leslie M. Tuck assumed the duty of supervision on his appointment as Dominion Wildlife Officer on October 1.

All dominion wildlife officers carried out 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 investigations of waterfowl reproduction and populations in several areas in British Columbia before his retirement on November 8, when he was succeeded as Dominion Wildlife Officer for British Columbia by R. H. Mackay. Mr. Munro had represented the department in migratory bird protection in Western Canada for 29 years.

J. D. Soper made extensive studies of the waterfowl situation in the Peace-Athabasca Delta region, along the Mackenzie River, and on the Arctic Coast of Mackenzie District, with particular regard to the need for bird sanctuaries in these areas and the selection of suitable locations for such bird sanctuaries.

D. G. Colls took part in the survey of waterfowl breeding conditions in Manitoba and Saskatchewan carried out co-operatively by the Canadian Wildlife Division, the U.S. Fish and Wildlife Service, provincial game authorities, and private agencies. He also investigated crop damage by waterfowl in the region adjacent to The Pas, Manitoba. Wildlife Management Officer J. B. Gollop and student assistant E. D. Fowler investigated crop damage by ducks near Brooks, Alberta. Student Assistant F. G. Cooch investigated the botulism epidemic among ducks at Whitewater Lake, Manitoba.

Wildlife Management Officer J. S. Tener began an ecological survey of Point Pelee National Park and made a survey of waterfowl populations and reproduction on the St. Lawrence and Ottawa Rivers. He also studied hunting success in certain areas in southern Quebec.

H. R. Webster visited the Magdalen Islands and submitted a special report on waterfowl conditions and enforcement of the Migratory Birds Convention Act there. Wildlife Management Officer G. F. Boyer carried out extensive bird-banding projects in the Maritime Provinces, and served as Canadian member of an international team studying waterfowl breeding success in those provinces. Student Assistant D. H. Pimlott continued studies of the populations and economic importance of herring gulls in the Grand Manan Archipelago, New Brunswick.

L. M. Tuck organized the Newfoundland section of the midwinter waterfowl inventory. Dominion wildlife officers and wildlife management officers throughout Canada participated in this inventory in their respective districts.

As of March 31, 1950, there were in Canada 76 bird sanctuaries set aside under the Migratory Birds Convention Act, covering an approximate total area of 1,800 square miles. Two of these—St. Peter's Bay, Labrador, Newfoundland, and Dionne Farm 4H, Province of Quebec—were established during the period under review. A small addition was made to the area of Nechako River Bird Sanctuary, British Columbia.

In remote 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, salaried game officers are employed by the Canadian Wildlife Division. Thirty-three such salaried officers were employed in the fiscal year ended March 31, 1950; 20 of these were employed on an annual basis and 13 on a seasonal basis.

Many 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 333 active holders of such appointments. 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 1949, the appointment of game officer *ex officio* under the Migratory Birds Convention Act.

The very dry conditions experienced in Western Canada in the early summer of 1949 exerted a detrimental influence on waterfowl reproduction in some of the major breeding areas. In British Columbia the waterfowl breeding population appeared to be considerably reduced, although mid-summer observations indicated an upward trend. In Alberta and Saskatchewan there was a serious decrease in southern areas, which was not compensated for by the increase reported in the parkland areas farther north. Manitoba showed a marked increase in waterfowl numbers, and the waterfowl populations in Ontario and Quebec were satisfactory. An increase in all species of waterfowl except American golden-eye was observed in the Maritime Provinces. Newfoundland reported increased numbers of American golden-eye and the largest Canada goose population in years.

Woodcock showed a decrease from 1948, except in Prince Edward Island, where a slight increase was noted.

The open season for ducks (and for geese, where the duck and goose open seasons coincided) was generally increased throughout all provinces. The increase varied from 7 to 11 days, but in most districts was 10 days. The open seasons in Newfoundland, provided there under the Migratory Birds Convention Act for the first time, were generally similar in length to those in the Maritime Provinces, but were shorter in the Avalon Peninsula and longer in Labrador. A split season was instituted in one district in British Columbia. Some minor changes were made in bag and possession limits.

With the co-operation of the Royal Canadian Air Force, 1,000 pounds of barley was transported by air to Lonesome Lake, British Columbia, where a flock of 80 trumpeter swans was threatened with starvation.

The barley was dropped by parachute on March 6 and was fed to the swans by R. A. Edwards, resident game warden employed by the Canadian Wildlife Division.

Co-operation in matters concerning migratory birds conservation was maintained between the service and provincial governments, game conservation societies, and other interested organizations.

Bird Banding

In order that the most advantageous steps may be taken toward adequate conservation and proper management of wild bird life as a natural resource, it is essential that certain classes of precise data relative to the migration and general biology of wild birds be available for study by various officials and agencies charged with this responsibility. The only practical and satisfactory method of obtaining much of the required information relating to wild birds in their natural habitat is that of systematic bird banding. Official bird bands are inscribed with distinctive numbers, whereby the birds marked with them may be identified as individuals when they are later recaptured, killed, or found dead. These bands also bear a return address to which their recovery should be reported.

In North America, bird banding is conducted co-operatively as an international joint project by the Canadian Wildlife Division and the Fish and Wildlife Service of the United States. Throughout Canada and the United States much of the banding work has been done by voluntary co-operators of recognized ornithological ability who, operating under authority of special permits, serve without remuneration from either Government, furnish their own equipment, and pay for any other incidental expenses.

Bird-banding activities in Canada have been under Government administration since 1923. At the close of the calendar year 1949, the official Canadian bird-banding records, which are kept as part of the records of the service, contained more than 592,000 records of birds that had been banded, as well as more than 47,800 records of recovered banded birds. It is interesting to note that birds banded in Canada have been recovered in at least 18 other countries.

The importance and practical usefulness of scientific bird banding as a systematic method of investigating various phases of wild bird life has been demonstrated and emphasized repeatedly for many years in international wildlife conservation. Much of the new and useful information made available through studies of data obtained as a result of bird-banding activities is published in current ornithological and wildlife conservation literature.

Bird banding in Canada continued to progress favourably during the period covered by this report. The wild ducks and geese of North America are of special importance, not only because of their value as a food supply, but also because they are a source of revenue, a tourist attraction, and an object of sport, healthful recreation and aesthetic enjoyment. During 1949 particular attention was given to the banding of wild ducks and geese on their main breeding grounds in Canada. This part of the bird-banding program was conducted as a joint co-operative effort on the part of the

Canadian Wildlife Division, the United States Fish and Wildlife Service, the Wildlife Management Institute, Ducks Unlimited (Canada), various provincial game departments, and some universities. It is gratifying to report that much useful and significant information has been obtained as a result of this particular part of the banding program.

The Canadian Wildlife Division appreciates the co-operation of all who have helped to further the success of bird banding by reporting the recovery of banded birds and urges all persons to report any banded birds which may come to their attention.

Miscellaneous

Under the provisions of the Migratory Bird Regulations, 1,753 permits and licences were issued. Of these, 450 were for scientific collecting; six for collecting eiderdown; 333 for scaring or destroying birds injuring agricultural or fishing interests; 18 for local control of the great black-backed gull by destruction of eggs and nests; 66 for local control of the herring gull by collection of its eggs; 11 for taking migratory birds for propagation; 795 for possession of migratory birds for propagation; and 74 taxidermists' licences.

Printed items distributed were: Migratory Birds Convention Act and Regulations, 8,246; abstracts of Migratory Bird Regulations, 18,200; posters, 1,371; and educational and instructive pamphlets, 11,345.

Wildlife in the Northwest Territories

Registration of Trapping Areas

Under regulations contained in the Game Ordinance, registration of trapping areas came into force in Mackenzie District during the fiscal year 1949-50. This plan provides for the granting to trappers of exclusive trapping rights in limited areas, so that they will be encouraged to manage carefully the fur-bearers found there and to effect improvements that will lead to increased fur production.

Information regarding trapping areas was collected in previous years by wardens of the Forest and Wildlife Protection Organization, assisted by the resident mammalogists. Applications are received by the wardens and certificates of registration are issued by the office of the District Administrator at Fort Smith. Area boundaries and boundary disputes are in most cases settled by consultation with the trappers themselves.

Prior to the end of the fiscal year, 310 certificates were issued. Forty-eight of these were for areas registered for groups of two or more trappers and 262 were for individual areas. Registered trappers numbered 425, namely, 257 Indians, 107 Eskimos, and 61 others.

Fur Production

Important production trends that began in 1948 continued in 1949. The take of all kinds of fox furs declined sharply; in the case of white fox the decline was more than one-third. The lowered production is partly due to prevailing low prices for fox furs, and partly to the numerical decline of white foxes reported in most areas.

The increase in the muskrat harvest continued and was well distributed over the areas where muskrats are trapped. Substantial increases were also noted in the take of beaver, marten, and mink.

No change in the extent of the areas in which beaver and marten may be trapped was made during the year. Where registration of trapping areas is in effect in the area where beaver may be taken, the trappers are allowed under new regulations to take beaver in proportion to the number of colonies of beaver in their areas. This is expected to encourage conservation of the beaver by the trappers, who will assure their future income by moderate trapping.

The Game Ordinance

Order in Council P.C. 2164 of May 2, 1949, authorized the issue of a proclamation bringing into force the amendment of the Northwest Territories Act, passed in 1948, which repealed the Northwest Game Act. The proclamation was issued on May 28, 1949. The superseding legislation, the Game Ordinance, assented to by the Northwest Territories Council on April 21, 1949, became effective on July 1, 1949, the date set by the proclamation for the repeal of the Northwest Game Act.

The important provisions of the Northwest Game Act and Regulations are included in the Game Ordinance, which continues the policy of conservation of the wildlife resources for the use and benefit of the resident aborigines. The Ordinance also contains important new features, including regulations providing for the registration of trapping areas in Mackenzie District. Under the Ordinance, all persons, including Indians and Eskimos, who hunt or trade and traffic in game in the Northwest Territories must obtain licences to do so, but Indians and Eskimos are not charged fees for such licences.

A number of additional changes in the regulations were effected by amendments of the Game Ordinance passed on September 22 and December 9, 1949, and on February 22, 1950.

Wood Buffalo Park Game Regulations

The game regulations previously in force in Wood Buffalo National Park were revoked and new regulations were established by Order in Council P.C. 5588 dated November 3, 1949.

The new regulations are similar in form and purpose to game regulations in force in the Northwest Territories under the Game Ordinance. They include provision for the registration of trapping areas in the park. Preliminary information is almost complete and registration is proceeding. Most trapping areas will be registered for groups of natives and other persons qualified by reason of having hunted in the park area before its establishment as a park.

The Fur Export Ordinance

The Fur Export Ordinance of the Northwest Territories, assented to on September 22, 1949, repealed the Fur Export Ordinance of 1929 and its subsequent amendments, and re-enacted the provisions thereof in revised form.

An amendment of the Fur Export Ordinance passed on October 27, 1949, and effective November 1, 1949, reduced the rate of tax to be charged on each pelt as follows: fox, black and silver, 75¢ to 35¢; fox, blue and white, 75¢ to 50¢; fox, cross, 75¢ to 30¢; fox, red, 25¢ to 20¢; lynx, \$1.50 to 75¢; mink, \$1.25 to \$1.00; skunk, 10¢ to 5¢; and squirrel, 2¢ to 1¢.

General

Nine fur farms were licensed to operate in the Northwest Territories during the fiscal year.

There were nine prosecutions for infraction of the game laws and convictions were secured in all cases.

Big Game Animals and Birds Reported Taken

	Year ended June 30	
	1949	1948
BIG GAME		
Caribou	8,301	15,987
Deer	—	11
Moose	187	306
Sheep (Mountain)	3	15
GAME BIRDS		
Ducks	7,652	10,435
Geese	348	838
Grouse	4,580	6,015
Ptarmigan	2,967	5,104

Licences and Permits Issued Under the Northwest Game Act and the Fur Export Ordinance

	Licences	
	Year ended June 30	
	1949	1948
Hunting and trapping		
Resident	358	379
Game bird	134	145
Trading and trafficking		
Resident	94	98
Non-resident	2	6
Non-resident, non-British ..	1	1
	Permits	
	Year ended June 30	
	1949	1948
To establish trading posts in N.W.T.	7	9
To take animals for propagation purposes	1	1
To take specimens for scientific purposes	24	14
To take (10) beaver	618	577
To take (5) caribou	66	38
To take (5) marten	761	1,060
To Indians to hunt and trap in Wood Buffalo Park	201	229

Revenue under Northwest Game Act and Fur Export Ordinance

	Year ended March 31	
	1950	1949
Hunting licences	\$ 1,500.84	\$ 797.88
Trading licences	2,120.00	924.82
Bird licences	571.00	359.00
Fur farm licences	13.00	19.00
Trading post permits	7.00	8.00
Caribou hunting permits	90.00	90.00
Sale of furs	770.75	359.90
Fur Export Tax	92,056.89	95,632.83
Fines and forfeitures	192.00	479.64
Sale of buffalo hides	14.00	1,320.00
Permits to export live animals	40.00	
Certificates of Registration	380.00	
	\$97,755.48	\$99,991.07

National Parks and Historic Sites Division

Canada's system of national parks now comprises 17 national parks and nine national historic parks ranging in size from a few acres to hundreds of square miles. The total area included in the national parks is 29,146 square miles, and the total area in national historic parks is 735 acres. The parks are administered under authority of the National Parks Act and Regulations made thereunder.

During the year a program of park development was continued on a broad scale. The total appropriations provided by Parliament for new work and for maintenance were the greatest in the history of park administration and permitted continuation of the extensive program of highway construction and improvement commenced in 1948. Travel to the parks exceeded in volume that of any previous year. Available tourist accommodation in the parks was extended by private enterprise on sites provided by the department. The construction of low rental cabin accommodation was undertaken by the National Parks Service in Eastern Canada in an effort to stimulate the development of this type of accommodation. The cabins will be leased to concessionaires for operation at reasonable rates. Camp-ground areas were extended in many of the parks and wider use of camping and recreational facilities was evident. Additional progress was made in the development of Fundy National Park, New Brunswick, the official opening of which is planned for 1950.

Three small parcels of land adjoining the western boundary of Mount Revelstoke National Park were acquired by purchase for park highway purposes. Steps were taken to obtain title to several hundred acres of freehold land in Banff National Park. This property was originally acquired by the owners prior to the establishment of the park for the development of mineral resources and for which purpose it is no longer required.

Travel to the Parks

The total attendance at the national parks was 1,840,636, the greatest number of visitors ever recorded in any fiscal year. This figure represents an increase of 477,642, or more than 35 per cent, over the same period in

1948-49, and was recorded notwithstanding the fact that traffic was impeded by road construction work in progress in many of the parks and on provincial approach roads during the visiting season. 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	1949-50	1948-49	Increase or Decrease
Banff	458,864	391,294	+ 67,570
Cape Breton Highlands	31,508	25,769	+ 5,739
Elk Island	135,403	66,541	+ 68,862
Georgian Bay Islands	6,420	6,794	- 374
Glacier	595	626	- 31
Jasper	84,538	72,392	+ 12,146
Kootenay	80,112	68,276	+ 11,836
Mount Revelstoke	11,659	12,795	- 1,136
Point Pelee	214,543	133,189	+ 81,354
Prince Albert	52,403	38,048	+ 14,355
Prince Edward Island	95,623	84,333	+ 11,290
Riding Mountain	294,693	213,328	+ 81,365
St. Lawrence Islands	34,927	27,154	+ 7,773
Waterton Lakes	148,926	86,717	+ 62,209
Yoho	38,153	34,654	+ 3,499
Sub-total	1,688,367	1,261,910	+ 426,457
National Historic Parks			
Fort Anne	16,283	14,547	+ 1,736
Fort Beauséjour	49,650	19,007	+ 30,643
Fort Chambly	43,488	28,319	+ 15,169
Fort Lennox	5,604	2,830	+ 2,774
Fortress of Louisbourg	8,236	5,012	+ 3,224
Fort Malden	11,835	14,004	- 2,169
Fort Wellington	6,650	8,390	- 1,740
Port Royal Habitation	10,523	8,975	+ 1,548
Sub-total	152,269	101,084	+ 51,185
GRAND TOTAL	1,840,636	1,362,994	+ 477,642

Direct Revenue

The net revenue of the National Parks and Historic Sites Division was \$605,719.76, as compared with \$630,162.08 for the preceding year, a decrease of \$24,442.32.

Special Events

Many events of special interest occurred in the national parks during the year. These included trail riding, trail hiking and mountaineering expeditions, tennis and golf tournaments, regattas, Indian Days celebrations, winter carnivals and ski meets. In addition, numerous organizations from Canada and the United States held conventions and meetings in the parks. The Alpine Club of Canada held its annual camp in the

Freshfield area at the head of Howse River in Banff Park. The annual cavalcade of the Trail Riders of the Canadian Rockies was conducted in the Pipestone area northeast of Lake Louise, and the annual outing of the Sky Line Trail Hikers was held with the central camp located in the Skoki Valley region. Open golf tournaments which attracted large entries were held in Banff, Jasper, Prince Albert, Riding Mountain, and Waterton Lakes Parks. The International Peace Park Committee of Rotary International held its assembly in Waterton Lakes Park.

A greatly enlarged program of winter sports was carried out successfully in Banff Park during the winter. The Inter-Collegiate Ski Meet and the combined Canadian and North American Ski Championships attracted a very large entry of competitors of international prominence. The events were held on the slopes of Mount Norquay where major improvements had been effected earlier in the season. In addition, the annual bonspiel and the Banff Winter Carnival were well attended. These events received wide publicity and resulted in greatly increased attendance in the park during the winter months.

The formal opening of the improved "Nels Nelson" Ski Jump in Mount Revelstoke National Park was held in February and some outstanding jumps were recorded. The competitors included Peter Hugsted of Norway, Olympic champion, and other outstanding figures in the skiing world. More than 5,000 spectators witnessed the events.

National Parks Information Services

There was continued expansion in the distribution of printed publications, releases to newspapers and magazines, exhibits and pictorial presentations, circulation of motion pictures, and public addresses. The value of healthful recreation for citizens of all ages and the suitability of the national parks for such activities were emphasized in all publicity.

In line with the post-war trend towards pictorial material, emphasis has been placed on the reorganization and replenishment of the Photo Library in order that publications can be illustrated attractively by up-to-date photographs. The increasing use of colour was reflected in the purchase of 379 Kodachrome and Ektachrome transparencies; 6,116 black and white photographs were also added to the Still Photo Library. New motion pictures in colour were produced and given wide distribution. These 16 mm. sound films have proven a popular method of publicity and they have undoubtedly stimulated interest in and attendance at the parks.

Illustrated booklets and information folders have been widely distributed through various channels, including Provincial and Park Information Bureaus, and other travel and transportation agencies. The total distribution for the year was 709,017, an increase of 308,431 over the previous year. Practically all current publications describing the national parks and national historic parks were redesigned and revised during the year. Several new booklets and folders were produced, including those describing Fundy National Park, the National Parks of Canada, Prairie Region, the Banff-Jasper Highway, and Game Fish and Angling in the National Parks. A new full-colour booklet, Birds of Canada's Mountain Parks, and a new Welcome Card for distribution to park visitors were designed and production was begun. Frequent news releases and special articles were distributed to the press and to magazines.

In co-operation with the Canadian Government Exhibition Commission, exhibits of national parks and conservation subjects were provided at the Pacific National Exhibition at Vancouver, the Manitoba Provincial Exhibition at Brandon, the Western Fair at London, and the Canadian National Exhibition at Toronto. Officers of the department attended these exhibitions to answer inquiries and to distribute national parks material. Addresses, frequently supplemented by screenings of park films, were delivered at various points in Canada.

National parks films were distributed throughout Canada by the regional distribution offices of the National Film Board, and 12,272 screenings were made to a total audience of 934,572 persons. A special program of film showings was provided in a number of national parks to summer visitors. In the United States through the co-operation of the Canadian Government Travel Bureau and other outlets 15,760 screenings were made to a total audience of 1,212,258 persons. A number of these films were also televised over United States networks on 57 separate occasions. New colour films portraying the attractions of Prince Albert National Park in Saskatchewan and Riding Mountain National Park in Manitoba were completed, and a new two-reel coloured film, *Historic Highway*, depicting historic parks and sites in Eastern Canada was nearing completion. Some progress was made on a new film describing Yoho National Park in British Columbia.

By means of a wider distribution of national parks publications and films for use as teaching aids, co-operation was maintained with educational authorities in providing children of school age with a wider knowledge of national parks and the value of wildlife conservation. General inquiries concerning national parks increased greatly during the year and were dealt with in 16,469 replies.

The cumulative effect of this post-war publicity policy, combined with the improvements carried out in the national parks, is reflected in a substantial increase in the number of park visitors. An all-time peak of 1,840,636 was reached during the fiscal year under review.

Maintenance and Improvements

Roads and Bridges

Good progress was made on the reconstruction and improvement of main highways preparatory to hard surfacing. In Jasper Park the reconstruction of the Jasper-Edmonton Highway, begun in 1948, was completed, and steel bridges were built over the Athabasca, Rocky, and Fiddle Rivers. Reconstruction of the Banff-Jasper Highway in Jasper Park was continued. Twenty miles of new grade were built and 16 miles of road gravelled. A 25-foot steel and concrete girder bridge was built to replace the old timber bridge over Whistler Creek at Mile 4. Reconstruction of the Maligne Canyon-Medicine Lake road in Jasper Park continued, and nine miles of the road was fine-graded. A new one-mile roadway to the Lake Edith Subdivision was cleared, graded, and gravelled.

Reconstruction of the seven-mile section of the Banff-Windermere Highway in Banff Park was completed and, in Kootenay Park, 20 miles were graded and 18 miles gravelled. Deck girder bridges were erected

over Haffner Creek and Kootenay River in Kootenay Park. Extensive road and bridge maintenance was carried out in Banff Park, including heavy gravelling on sections of the Banff-Jasper Highway and on No. 1 Highway west from Lake Louise to Yoho Park boundary. Several bridges were reinforced and the safe load tonnage increased, and all bridges north of the Bow Summit, exclusive of the Saskatchewan River bridge, were painted. In Yoho Park a new bridge over the Kicking Horse River, linking the town of Field with the main park highway, was completed.

Reconstruction of the Akamina Highway, one of the outstanding scenic drives in Waterton Lakes Park, was completed, and those portions of the Cardston and Pincher Creek approach roads within the park were reconstructed preparatory to hard surfacing. The Chief Mountain International Highway within the park was treated over its entire length of 14.3 miles with a seal coat of rock chips and asphalt. In Prince Albert Park, reconstruction of the main park highway was completed by the rebuilding and gravelling of 14 miles of road during the season. Construction of a new bridge over the Spruce River near the Buffalo Paddock was also carried out. Reconstruction of the Dauphin-Clear Lake Highway in Riding Mountain Park was completed. Realignment and reconstruction of sections of the Cabot Trail in Cape Breton Highlands Park was continued and 12 miles of highway were graded and gravelled. Improvements to the Dalvay-Covehead road in Prince Edward Island Park, preparatory to hard surfacing, were practically completed, and a survey of the proposed Covehead-Rustico road was undertaken. Reconstruction of 12 miles of Provincial Highway No. 14 which crosses Fundy National Park was practically completed. Also in Fundy Park, the right of way on the Point Wolf and Herring Cove roads was cut out, the latter road being relocated. Four miles of the right of way on Shepody road were also cut out, beginning in the northwest corner of the park.

Trails

In Banff Park 17 miles of trail from Saskatchewan Crossing towards Howse Pass were constructed to replace the old gravel bar trail. Three miles of fire trail, including a bridge over Paradise Creek, were built east from Lake Louise, south of Bow River. The trail in Paradise Valley was rebuilt and improved, and six-foot bridges were erected. An additional five miles of trail to Lake of Islands were cleared. In Glacier Park the fire road from Glacier to Flat Creek Cabin was completed by the building of 10½ miles of road. A new 11-mile trail from Bostock Pass down the fork of Mountain Creek to a point near the junction with the main valley of Mountain Creek was built. In Jasper Park the Geraldine fire-trail was completed to the lookout site. A new bridge was erected over the mouth of Maligne River, the outlet of Cavell Lake was bridged, and an additional 300 yards of trail were constructed. In Kootenay Park 4½ miles of the West Kootenay Trail were improved to fire road standard. In Waterton Park four miles of new trail along the north fork of the Belly River towards the International Boundary were completed. In Yoho Park a new trail approximately five miles in length was constructed from the Lake O'Hara Trail to Linda Lake. In Cape Breton Highlands Park all trail bridges on the Cheticamp River Trail were reconstructed of peeled logs.

Communication Systems

In Banff Park seven miles of telephone line from Mount Eisenhower Warden Lodge to Kootenay Park boundary were rebuilt along the new highway. Three 2½-watt radio trans-receivers were added to the park radio communication equipment. In Elk Island Park 17 miles of metallic circuit telephone line were constructed through the park to replace the former ground system. The provincial telephone system was extended on park system poles from the Administration Building to Sandy Beach. In Fundy Park telephones were installed in the Administration Building and the superintendent's residence and connected with the New Brunswick Telephone Company lines. Relocation of the long distance telephone line along the park highway in Prince Albert Park was commenced, and poles with side brackets were set along 20 miles of road.

The following table indicates the existing mileage of roads, trails, and telephone lines within the national parks, as of March 31, 1950:

Roads

National Parks	Motor	Secondary	Fire	Trails	Telephone Lines
	Miles	Miles	Miles	Miles	Miles
Banff.....	180.9		106.0	727.75	306.15
Cape Breton Highlands.....	50.8	5.0		33.26	
Elk Island.....	17.0	10.0		5.0	17.0
Fundy.....	12.0	10.9			
Glacier.....			33.5	106.5	2.0
Jasper.....	162.5	9.0	61.0	569.0	374.7
Kootenay.....	61.1		14.0	150.5	60.0
Mount Revelstoke.....	18.5			63.0	11.0
Point Pelee.....	6.0	5.5			
Prince Albert.....	65.7	48.0		298.25	129.0
Prince Edward Island.....	14.5	3.11			
Riding Mountain.....	51.6	52.9		119.0	227.5
Waterton Lakes.....	47.3	13.5		150.4	76.0
Yoho.....	45.0	6.5	26.5	209.0	72.5
Total.....	732.9	164.41	241.0	2,431.66	1,275.85

Buildings

In Banff Park, 171 building permits authorizing building construction by private enterprise were issued. Major projects included two chalets erected by the Banff School of Fine Arts, one business and apartment block, and two business blocks. Nineteen new buildings were erected in auto bungalow camps throughout the park. Construction undertaken by the National Parks Service in Banff Park included the erection of four prefabricated houses for staff quarters, an abattoir, and a greenhouse. A number of former P.O.W. buildings were converted for various purposes, and a new warden's lodge at Bow Summit was partially completed. In Cape Breton Highlands Park a new staff quarters building and warden stores building were erected in addition to three patrol cabins. In Elk Island Park four 8-unit flush toilet buildings were constructed in the recreation area. In Fundy Park the superintendent's residence, Admin-

istration Building, stores, kitchen and dining-room, bunk-house and warden's cabin were completed. The golf club-house was nearing completion. Work continued on the registration building.

In Jasper Park 68 building permits were issued. Construction of the firehall extension and information bureau was completed. Development of the new Government industrial area included the erection of 4 Quonset buildings for stores, garage, warden stores, and laundry purposes. Construction of a new upper reservoir at Cabin Creek was nearing completion. Other construction included a bunk-house 22 feet by 28 feet at Sawmill on Whirlpool River; an insulated meat house and shelter cabin at Buffalo Prairie; and a covered oil and gasoline platform and a new frame caretaker's cabin and toilet at Miette Springs. In Kootenay Park a bunk-house and dining-room were completed. A temporary bath-house was erected and work begun on the construction of a new modern permanent bath-house and swimming pool to replace the one destroyed by fire. At Mount Revelstoke Park a new log cabin was completed at Silver Creek. In Prince Albert Park a warehouse, refreshment stand, and comfort station were constructed. In Prince Edward Island Park construction included the following: seven kitchen shelters (semi-open type); a bath-house at Stanhope camp-ground; a storehouse building for the warden station at Cavendish; and a combined garage and storehouse in the Dalvay area. The building known as *Green Gables* was partially reconstructed, and a caddy house was erected at Cavendish. In St. Lawrence Islands Park two bath-houses and a toilet were constructed at Mallorytown Landing. Six new wharves were built. In Waterton Lakes Park 23 building permits were issued. Administration construction included a third staff residence, a storehouse, and two additions to storehouses. The immigration staff quarters at Chief Mountain were completed. A caretaker's cabin at Red Rock camp-grounds was practically completed. Good progress was made on the hatchery assistant's quarters. In Yoho Park a prefabricated house was erected in Field for the use of the chief park warden, and a Quonset building was erected for storage purposes.

Townsites

In Banff Park the survey of a number of blocks of townsite lots in the vicinity of the railway station was carried out. Water services were extended for 2,535 feet on Mountain and Kootenay Avenues. Sewer lines totalling 7,555 feet were laid on Kootenay, Rundle, Wolverine, and Bow Avenues. Replacement of the sulphur water line from Kidney Springs to the Canadian Pacific Railway hotel and hospital was completed. Approximately one-third of the new storm sewer system was completed with the laying of 7,219 feet of sewer. The new parking area at Lake Louise townsite was 70 per cent completed. The survey of the new cemetery on the Minnewanka Road was completed and roads in the area were graded. In Kootenay Park a new water supply was built. In Prince Albert Park extensions to the business section and to the residential subdivision at Prospect Point were surveyed. Construction of the breakwater continued.

Tourist Accommodation and Camp-grounds

In Banff Park extension of facilities at Johnston Canyon camp-grounds was continued. A second picnic shelter was built, a service building constructed, a recreation unit practically completed, and a water

tower 85 per cent completed. The Canadian Youth Hostel Association completed a hostel at Lake Louise and had under construction another hostel east of Mount Eisenhower. The National Parks Service supplemented accommodation at these hostels by the erection of three pre-fabricated buildings—one dining-kitchen unit and two bunk-houses. Nineteen new buildings were constructed in various bungalow cabin concessions.

In Jasper Park a youth hostel at Mount Edith Cavell was completed, and a hostel at Miette Hot Springs was partly completed. In Glacier Park two camp shelters and two toilet buildings were constructed. Six new cabins were added to auto bungalow camp concessions in Waterton Lakes Park. In Elk Island Park 25 additional tables were constructed and placed in the picnic area. Eight outdoor kitchens, complete with stoves, were constructed, and drinking water lines laid to all kitchens from the newly constructed tower tank. In Prince Albert Park 80 new lots were laid out for camping at the Waskesiu camp-ground, in addition to a trailer park section with individual electric and water connections. Four kitchen shelters and two toilets were also constructed. In the St. Lawrence Islands Park many new open-air camp stoves and incinerators were constructed on various islands, and picnic tables with attached benches made available. The National Parks Service undertook the construction of low rental tourist cabins in the maritime parks. At the end of the fiscal year 13 cabins in Prince Edward Island Park and 14 cabins in Fundy Park were completed. Ten cabins in Cape Breton Highlands Park were approximately 70 per cent completed. These cabins are to be leased to concessionaires. Work continued on the construction of a gravity water supply system in Cape Breton Highlands Park. In Fundy Park several temporary camp-ground sites were selected and small fire-places constructed.

Recreation

In Banff Park additional clearing was carried out on the upper ski slopes of Mount Norquay and repairs were made to the ski jump. Construction of a central recreational project in Jasper Park, including an outdoor swimming pool, dressing rooms, tennis courts, bowling green and sports field was continued, and at the end of the fiscal year was nearing completion. In Kootenay Park work continued on the construction of a new swimming pool and bath-house. Improvements were made to the ski hill in Mount Revelstoke Park. In Elk Island Park foundations were laid and graded for a bowling green and tennis courts. In Point Pelee Park playground equipment was installed at the picnic area. A bowling green was completed at Cape Breton Highlands Park. In Prince Edward Island Park a bowling green and two tennis courts were completed. In Fundy Park a heated salt-water swimming pool, bath-house and golf club-house were virtually completed.

Conservation Services

Forest Protection

A total of 61 fires were reported during the fire season, which extended from April to October. This number was nearly three times as many as occurred in 1948, the increase being largely due to a general

Forest Fires

decrease in precipitation which resulted in periods of high and extreme hazard throughout the season.

Out of a total burned area of 14,474 acres, it is interesting to note that 14,449 acres, or 99.8 per cent, were in Riding Mountain and Prince Albert Parks. Fortunately most of this area was grassland and the loss of merchantable timber and young growth was negligible, when compared with the area burned and the total number of fires.

An analysis of the causes of fires shows that camp-fires were responsible for 24.6 per cent, smokers 19.6 per cent, lightning 14.7 per cent, settlers 8.2 per cent, railways 6.6 per cent, public works and miscellaneous each 4.9 per cent, incendiary 6.7 per cent, and unknown 9.8 per cent. Fires originating from clearing operations of settlers were all confined to Riding Mountain, Prince Albert, and Elk Island Parks.

Fire Losses in the National Parks

Park	Number of Fires		Area Burned Acres		Cost of Suppression	
	1948	1949	1948	1949	1948	1949
					\$ cts.	\$ cts.
Banff.....	8	17	330	12½	139 68	332 35
Jasper.....	2	10	2½	2½	6 56	107 79
Glacier.....	0	0	0	0	0 00	0 00
Kootenay.....	0	5	0	2	0 00	781 55
Yoho.....	1	1	Spot	Spot	27 80	13 75
Mount Revelstoke.....	1	1	¼	Spot	91 17	12 15
Waterton Lakes.....	0	2	0	½	0 00	76 25
Elk Island.....	0	1	0	3	0 00	6 00
Prince Albert.....	2	6	30½	10,495	300 37	9,679 24
Riding Mountain.....	4	13	3,987½	3,954½	323 74	1,040 10
St. Lawrence Islands.....	4	2	3½	1½	69 00	79 25
Point Pelee.....	0	1	0	Spot	0 00	0 00
Georgian Bay.....	0	0	0	0	0 00	0 00
Cape Breton Highlands.....	0	1	0	¼	0 00	0 00
Prince Edward Island.....	0	0	0	0	0 00	0 00
Fundy.....	0	1	0	4	0 00	69 00
Total.....	22	61	4,354½	14,474	958 32	12,197 43

Improvements in Fire Fighting Equipment

During the year seven new steel fire lookout towers were purchased. These included three 80-foot steel towers for Cape Breton Highlands Park, one 40-foot and one 60-foot tower for Riding Mountain Park, one 40-foot tower for Banff Park, and one 50-foot tower for Jasper Park. In Cape Breton Highlands Park, one of the 80-foot steel towers erected on Mount Franey was blown down on February 24 during one of the worst gales that the park has ever experienced. In Riding Mountain Park one 60-foot tower was erected in the Rolling River area and one 40-foot tower in the Seech area. The remaining four towers have not yet been erected although some of the preliminary work has been completed. In Kootenay Park work was begun on the construction of a lookout cabin on Vermilion Peak, and the erection of a 30-foot wooden tower in the vicinity of Wardle Mountain is under consideration. Including the three towers erected during the past season, the total number of primary lookouts in the national parks is now 17.

New equipment purchased included 20 gasoline pumps, 22,000 feet of 1½-inch forestry hose, 66 hand pumps, 86 water thieves, 32 Siamese couplings, 24 mess kits, 84 grub hoes, and one hose winder as well as many other smaller items. In addition two three-ton triple combination fire trucks were purchased for use in the Townsites of Waskesiu in Prince Albert Park and Field in Yoho Park.

Fire Weather Forecasting

Weather conditions were not as favourable as they were in 1948, and sustained periods of extreme fire-hazard occurred in the prairie parks from the middle of April to the middle of May. In the mountain parks in Alberta periods of extreme hazard started in April, and, with diminishing intensity, extended to the end of August. In Yoho Park in British Columbia high hazard did not present any problem, conditions very seldom getting above the moderate danger point throughout the season. In Ontario dry weather starting in June resulted in extreme hazard conditions which continued until September. In the maritime parks conditions were mostly favourable with a few periods of extreme hazard in Cape Breton Highlands Park during July and August.

All fire danger stations were in operation from the beginning of May until the end of September. Owing to the early spring and late autumn fire-hazard which existed in the prairies, it was found necessary to open the stations in Prince Albert and Riding Mountain Parks in April and to keep them open until the middle of October. There are now 18 fire danger stations in operation in the national parks.

Insect Control

On the advice of the Division of Entomology a research party was organized in the spring to investigate the infestation of the lodgepole pine leaf needle miner in the western mountain parks. Early in January, 1950, a report covering the activities of this research party indicated that although a great deal of useful and new information on the life history and habits of this insect was obtained, no effective means of control by spraying has yet been found. It was recommended that control of this insect would probably best be accomplished by natural means such as parasites and a long term forest management program. With this in view it was further recommended that these investigations be continued during the season of 1950.

Disposal of Timber

The only large-scale timber operation carried on in the national parks is in Riding Mountain Park, where the cutting of saw-timber, fuelwood and other forest products is carried on under a forest working plan. All cutting under this plan is carried out by individual permit issued to local settlers. During the past year a total of 1,300 permits were issued for 2,459,950 feet board measure of saw-timber, 9,430 cords of fuelwood, 41,080 posts, 36,645 linear feet of poles, and 6,730 trees. The total number of permits issued was 219 less than for a corresponding period in the previous year.

Limited operations were also carried out in Prince Albert Park where 270,000 feet board measure of spruce were cut for the use of the National Parks Service. In addition 36 timber permits were issued to local settlers

for 65,500 feet board measure of fire-killed saw-timber, 521 cords of fuelwood, and 1,600 fence-posts. All timber from the clearing of the Prince Albert Highway was salvaged and disposed of for saw-timber and fuelwood.

In Banff Park logs salvaged from clearing operations on the Banff-Windermere Highway produced approximately 300,000 feet board measure of saw-timber for park use. In Jasper Park a total of 64,836 feet board measure of saw-timber was cut for use in the park.

On the whole regulations controlling the cutting of timber in the national parks were well observed.

National Historic Parks and Sites

The restoration, preservation, and administration of national historic parks and sites and the commemoration of the public services of outstanding persons in Canadian history is carried out by the National Parks and Historic Sites Division. In this phase of its work the division is advised by the Historic Sites and Monuments Board of Canada, an honorary body of recognized historians representing the various provinces of Canada.

During the year the board suffered a severe loss in the death on March 16, 1950, of Dr. J. C. Webster of Shediac, New Brunswick. A distinguished surgeon and outstanding historian, Dr. Webster was a member of the board for 27 years and was its chairman since November 1943.

The personnel of the board is as follows: 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; Dr. Walter N. Sage, Vancouver, British Columbia; the Honourable Thane A. Campbell, Charlottetown, Prince Edward Island; Dr. Wm. Kaye Lamb, Dominion Archivist, Ottawa, Ontario; C. E. A. Jeffrey, St. John's, Newfoundland; and W. D. Cromarty, National Parks and Historic Sites Division, Ottawa, Ontario.

The annual meeting of the board was held in Ottawa, May 30, 31, and June 1, 1949, when a wide variety of matters relating to the historic background of Canada were reviewed. Of the many sites that have been considered by the board to date, 390 have been marked or acquired and 194 others recommended for attention at a later date.

National Historic Parks

Fort Anne National Historic Park, Nova Scotia

The exterior of the museum building and some of the interior wood-work was painted as well as the chain fences, cannon, cannon balls, and wooden signs. Improvement work was carried out on the driveway, paths, and moat, the hedges were trimmed, and all bronze tablets on the park grounds were cleaned.

A total of 16,283 persons signed the museum register during the year.

Port Royal National Historic Park, Nova Scotia

A section of the palisades was rebuilt, repairs were made to the roof of the Habitation and additional gravel was spread in the magazine. The buildings and grounds were carefully maintained, some of the interior

woodwork was painted, and all ironwork was cleaned and oiled. The Scots Fort area was cleared of stones and brush and the roadway leading to it levelled and graded. The site of the John Robblee house was filled in and levelled.

Visitors registered at the park during the year numbered 10,523.

Fortress of Louisbourg National Historic Park, Nova Scotia

Considerable repair work was carried out on the walls of the museum building in an effort to prevent leakage by the driving rains. Repairs and repointing were made to the old casemates and to the remains of the hospital and de Mesy buildings. The museum and custodian's residence were painted, the condition of the entrance road was improved, the flagpole and pump-house were painted, and repairs were made to the sewage system. The fence enclosing the park was repaired, the bases of the monuments were painted and new field signs were erected.

A total of 8,236 persons signed the visitors' book.

Fort Beauséjour National Historic Park, New Brunswick

A hand-drawn ice boat used prior to the establishment of the ferry service between Cape Tormentine, New Brunswick, and Port Borden, Prince Edward Island, was donated to the park by the Canadian National Railways. A section of the park area near the museum was levelled and seeded, new road signs were erected, and the trees and brush were removed from along the old trench lines. The John Clarence Webster Wing of the museum was officially opened on August 2, 1949, by the Hon. Colin Gibson, then Minister of Mines and Resources.

It is estimated that close to 50,000 persons visited the park during the year.

Fort Chambly National Historic Park, Quebec

The interior of the museum was completely redecorated, all display cases were stained and varnished and the main entrance door to the fort was painted. A protection wall was constructed along the river front of the park property to prevent further erosion, and repairs were made to the walls of the fort. Repairs were made to the custodian's residence, a sump pump was installed, a new base was made for one of the gravestones in the cemetery, and top dressing was spread on the lawns.

During the year 43,488 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. Repairs were made to the Men's Barracks and Officers' Quarters. The roofs of the guard house, Officers' Quarters, and boat house were painted. A temporary wharf was constructed on the west side of the island for the convenience of visitors, the ramparts around the fort were cleared of dead timber, the casemate doors and picnic tables were painted, all bronze tablets were cleaned, and the grounds and cemetery were properly maintained.

Visitors registered at the park during the year numbered 5,604.

Fort Wellington National Historic Park, Ontario

The highway fronting the fort property was reconstructed, the expense in connection with this work being shared equally by the province, the municipality, and the National Parks and Historic Sites Division. The telephone poles along the front of the park property were removed, the cable being placed underground. The fort buildings were painted, repairs were made to the guard house, additional lighting fixtures were installed in the new museum, renovation work was carried out in the custodian's quarters, and the grounds were properly maintained.

A total of 6,650 persons signed the museum register during the year.

Fort Malden National Historic Park, Ontario

A layer of crushed stone was spread on the driveway and paths, and repairs were made to the eave troughs on the Old Mess Hall and to the drain pipes on the "Old Fort" building. New museum cases were obtained to display the exhibits which are continually being received, concrete bases were constructed on the park grounds for a water fountain, anchor, and naval gun, the posts and rails along the steps of the moat were painted, and the dead trees were removed.

During the year 11,835 persons signed the museum register.

Fort Prince of Wales National Historic Park, Manitoba

General supervision was carried out.

National Historic Sites

Sir Louis Henry Davies, K.C.M.G. and Sir Joseph Pope, K.C.M.G., C.V.O., Charlottetown, Prince Edward Island

Tablets were placed in the Confederation Building to Sir Louis Henry Davies, Premier of Prince Edward Island and Chief Justice of Canada, and to Sir Joseph Pope, Private Secretary to Sir John A. Macdonald, 1882-91, and Under-Secretary of State for Canada, 1896-1926. The tablets were unveiled on August 25, 1949.

Robert Harris, C.M.G., Charlottetown, Prince Edward Island

A tablet was placed in the Harris Art Gallery Building to Robert Harris, painter of the historic picture "The Fathers of Confederation". He was a charter member of the Royal Canadian Academy and its President, 1893-1906. The tablet was unveiled on August 25, 1949.

Isgonish-French River Portage, near Truro, Nova Scotia

A cut-stone monument with tablet was erected adjacent to Highway No. 2 west of Truro to mark the Isgonish-French River Portage, the chief route of the French and Indians from Cobequid to Isle St. Jean and Louisbourg and later of the British from Halifax to Charlottetown.

Captain Savalette, Tor Bay, Nova Scotia

A tablet was placed on a large boulder at the side of the road at Tor Bay, to Captain Savalette, pioneer of "dry" fishery in Nova Scotia. Among the islands in the bay there he carried on the "Sedentary" fisheries for 42 years prior to 1607, when he entertained both Champlain and Lescarbot on their way from Port Royal to Canso. The tablet was unveiled on July 30, 1949.

Sir George Augustus Westphal, Sir Provo William Parry Wallis, K.C.B., G.C.B., Sir Edward Belcher, K.C.B., Philip Westphal and George Edward Watts, C.B., Halifax, Nova Scotia

Tablets were erected in the Maritime Museum Building, HMC Dockyard, to these distinguished persons all of whom were born on one side or the other of Halifax Harbour and rose to the rank of admiral in the Royal Navy. The tablets were unveiled on August 8, 1949, in the presence of officers of the Royal Navy, the United States Navy, and the Royal Canadian Navy.

Sir John Sparrow David Thompson, P.C., K.C.M.G., Halifax, Nova Scotia

A tablet was placed on the North End Postal Station to Sir John Sparrow David Thompson, Attorney General of Nova Scotia, 1878-82; Premier, May to July, 1882; Justice of the Supreme Court, 1882-85; Minister of Justice of Canada, 1885-94, and Prime Minister, 1892-94.

Harriette Taber Richardson, Port Royal National Historic Park, Lower Granville, Nova Scotia

A tablet was erected in the Habitation in honour of Harriette Taber Richardson who first envisioned the restoration of this building as an "Act of International Good Will". The tablet was unveiled on August 30, 1949, under the auspices of the Annapolis Royal Historical Association.

Sir John George Bourinot, K.C.M.G., Sydney, Nova Scotia

A tablet was placed on the Post Office Building to Sir John George Bourinot, historian and authority on parliamentary procedure. He was Clerk of the House of Commons, 1880-1902, and President of the Royal Society of Canada, 1892-93.

Sir George Parkin, K.C.M.G., and Sir George Eulas Foster, G.C.M.G., Saint John, New Brunswick

Tablets were erected in the main hall of the New Brunswick Museum to Sir George Parkin, educationist and author, and to Sir George Eulas Foster, statesman, orator, and administrator.

Lemuel Allan Wilmot, Fredericton, New Brunswick

A tablet was erected in the Legislative Assembly Building to Lemuel Allan Wilmot, statesman and jurist. He was an advocate of responsible government and Lieutenant-Governor of New Brunswick, 1868-73.

Sir Charles Edward Saunders, London, Ontario

A tablet was erected in the City Hall to Sir Charles Edward Saunders, distinguished experimental agriculturist. His development of Marquis wheat added untold wealth to his native land.

Adam Shortt, C.M.G., London, Ontario

A tablet was erected in the Court House Building to Adam Shortt, economist, educator, and historian. He was Professor of Political Science in Queen's University, 1891-1908; Civil Service Commissioner, 1908-18 and co-editor of "Canada and its Provinces".

Sir John Stephen Willison, K.B., Goderich, Ontario

A tablet was placed on the Court House Building to Sir John Stephen Willison, journalist, author, and publicist. He was editor of *The Globe*, 1890-1902, and of *The News*, Toronto, 1902-1910. The tablet was unveiled on November 16, 1949, under the sponsorship of the County Council of Huron.

Sir William Buell Richards, K.B., Brockville, Ontario

A tablet was placed on the Court House Building to Sir William Buell Richards, jurist and legislator. He was Attorney-General for Canada West, 1851-53, and First Chief Justice of the Supreme Court of Canada, 1875-79. The tablet was unveiled on September 2, 1949.

Sir Richard William Scott, K.B., Prescott, Ontario

A tablet was placed in the Town Hall to Sir Richard William Scott, Secretary of State for Canada, 1874-78 and 1896-1908. He was father of the Canada Temperance Act, 1878 ("The Scott Act"). The tablet was unveiled on September 3, 1949, during the centennial celebration at Prescott.

La Verendrye's Journey to the Mandans near Morden, Manitoba

A boulder with tablet was erected adjacent to Highway No. 3, about 10 miles west of Morden, to commemorate La Verendrye's journey through that region. With two of his sons he left Fort La Reine on October 18, 1738, on his way to the country of the Mandans whence, by following the Missouri, he hoped to reach the western sea. The monument was unveiled on Labour Day, September 5, 1949, under the auspices of the Pembina Hills Historical Society.

First Legislature of Manitoba, Winnipeg, Manitoba

A tablet was placed on the National Canadian Bank Building, Main Street, to commemorate the first Legislature of Manitoba, which met in the nearby home of the Honourable A. G. B. Bannatyne, on March 15, 1871.

Preservation of the Plains Buffalo, Elk Island National Park, Alberta

A cut-stone monument with tablet was erected on the beach lawn to commemorate the preservation of the plains buffalo. Ruthlessly slaughtered for meat and hides this noble animal almost became extinct, but in 1906 the Federal Government procured in Montana the last large herd. Their offspring now graze by thousands in various national parks of Western Canada. The monument was unveiled on Labour Day, September 5, 1949, under the auspices of the Historical Society of Alberta and the Northern Alberta Pioneers and Old Timers' Society.

Okanagan Brigade Trail, Westbank, British Columbia

A cairn with tablet was erected adjacent to the highway at the eastern outskirts of Westbank to mark the Okanagan Brigade Trail, a link in the fur-trading route from New Caledonia (North Central British Columbia) to the Columbia River. First explored by the Astorians in 1811, the trail was used by the North West Company and from 1821 by

the Hudson's Bay Company. The fur brigades from New Caledonia journeyed by this route from Kamloops to "Fort Okanagan" until 1848. The monument was unveiled on August 24, 1949, under the auspices of the Okanagan Historical Society and the Westbank Women's Institute.

National Museum of Canada

The fiscal year 1949-50 was a very important one in the history of the National Museum of Canada and may be said to have inaugurated a new era for it. The museum began and grew up within the Geological Survey, which began its work in 1842, and is thus the oldest scientific branch of the Federal Service. In 1920 the two were separated and placed under different directors. They continued, however, to occupy the same building, the Victoria Memorial Museum, and to share some of the same services and even at times the same administration. By a reorganization which became effective in January, 1950, the two passed into different Government departments, the Geological Survey into the Department of Mines and Technical Surveys and the National Museum into that of Resources and Development.

During the year field work was carried out by the National Museum in many parts of Canada; collections were added to through gifts, purchases, and field activities; exhibits were enlarged and improved; reports and bulletins were prepared for publications; and educational work was expanded.

A detailed and complete review of museum activities is to be found in the Annual Report of the National Museum, 1949-50.

Field work in zoology was carried out in northern British Columbia and the Yukon, on Prince Patrick Island in the western Arctic, and in Newfoundland. Botanical studies were made on Victoria and Bank Islands in the Arctic, along the east coast of Hudson Bay and the islands of Foxe Basin, and in the region north of Lake Winnipeg in Manitoba. Archaeological sites were investigated on Cornwallis Island, in northern British Columbia and the Yukon, and along the western margin of the Canadian Shield in Manitoba, Saskatchewan, and the Northwest Territories. Similar investigations were made in southern Ontario. Ethnological studies of folk-songs and folk-lore were made in Nova Scotia, Quebec, and Ontario. For the botanical work performed on Banks Island, along the east coast of Hudson Bay, and on the islands of Foxe Channel, the National Museum wishes to acknowledge the generous assistance afforded by the Geographical Bureau.

A red fox group was completed and is now on display in the habitat hall. Progress was made on the painting of a large mural over the wood buffalo group. This panel represents a huge herd of buffalo crossing a river on the western plains. Three large paintings of dinosaurs were finished and hung in the hall of vertebrate palaeontology. A replica of the famous pink diamond presented to Princess Elizabeth was received from Dr. J. T. Williamson of Tanganyika.

In July and August a group of paintings of West Coast Indian life by Judith Morgan was on exhibit in the rotunda of the museum. During the same months a film program, *Canada in Colour* was shown in the lecture room in the afternoons from Monday to Friday. This feature, which was very popular the preceding summer, is designed to give visitors to Ottawa an opportunity to see films of interesting parts of Canada. In addition to the regular series of Wednesday evening lectures, a special lecture

attended by Their Excellencies the Governor-General and the Viscountess Alexander of Tunis was given by Lieutenant Colonel Niall Rankin on March 9, on *A Naturalist in the Antarctic*. The Saturday morning lectures for children were well attended and the Macoun Field Club of young naturalists, which was organized in September, 1948, had a most successful year.

The archaeological section was strengthened by the appointment of Dr. Richard S. MacNeish and that of ethnology by the addition of Miss Margaret Sargent and Miss Josephine Hambleton. Miss V. M. Humphreys joined the staff as an assistant in education.

The National Museum issued its annual report for 1948-1949 and a bridging volume of annual reports covering 1939 to 1947, years in which no separate annual reports for the museum were published. A bulletin by W. E. Godfrey, *Birds of Lake Mistassini and Lake Albanel, Quebec*, was published. Other bulletins being printed include *The Flora of Bic and the Gaspé Peninsula* by H. J. Scoggan; *Folk-lore of Lunenburg County, Nova Scotia* by Helen Creighton; *Folk-lore of Waterloo County, Ontario* by W. J. Wintemberg; *Botany of Southeastern Yukon Adjacent to the Canol Road* by A. E. Porsild; *Totem Poles* in two volumes, by Marius Barbeau; and *Birds of the Cypress Hills and Flotten Lake Regions, Saskatchewan* by W. E. Godfrey.

The Chief Curator represented the department at the Sixteenth Congress of the International Geographical Union held at Lisbon, Portugal, in April. This afforded him an opportunity to visit the museums of Lisbon and of London, England. On November 30 he gave an illustrated lecture, *The Geology of Canada*, before the geological faculty and students of the University of Toronto at Toronto; on March 18 a talk on *Portugal* before the Las Americas Club of Ottawa; and on March 24 an address, *The Mineral Resources of Canada*, before the Canadian Club of Perth. On February 20, as part of the radio program of the Professional Institute of Canada, he took part in a broadcast over CKOY on the National Museum of Canada.

Educational Work

The varied work in education continued to be one of the important functions of the National Museum. Through its education services the scientific work of the museum is interpreted to educators, school and natural science groups, and the general public by means of loans of visual material, correspondence and publications, and participation by groups of this type in the activities of the museum at Ottawa. While the National Museum concerns itself with adult education, children are its most numerous and inquiring visitors. Thousands of them come every year, with or without their teachers, to learn by seeing things available only in a museum. Information and study material is made available to more advanced students in the natural sciences.

Miss M. W. Godwin reports that, in addition to those from Ottawa and vicinity, teachers, normal school students, and high and elementary school pupils came in organized groups from Canton, N.Y., Belleville, Gananoque, Montebello, North Bay, Pembroke, Toronto, and other localities. During the Boy Scout Jamboree in August, groups of Scouts from all parts of Canada and from the United States and Cuba visited the National Museum daily. A group of 50 high school boys from the United Kingdom paid an evening visit to the museum.

A special exhibit illustrating the educational work of the National Museum was displayed at the Saskatchewan Teachers' Convention, and a photographic exhibition was arranged for the Prospectors and Developers Association annual meeting in Toronto March 5-8.

Those taking part in special museum activities numbered 51,561. Visitors to the exhibition halls, representative of many groups of the general public, numbered 169,344. The total attendance during the year was 229,266 which included also organized school and other groups.

The National Museum collaborated in several C.B.C. coast-to-coast broadcasts on the topic *Prehistoric Canada*. The wide interest aroused by these broadcasts was indicated by the number of requests for copies received at the museum from all parts of Canada, and many parts of the United States.

National Museum Lectures

The museum lectures had a total attendance of 21,365. The program for the 1949-50 season follows:

Adult Lectures

Maps of the Middle Ages—by Professor George H. Kimble, B.A., M.A., A.K.C., Chairman, Department of Geography, McGill University.

Why British Columbia was Discovered—W. Kaye Lamb, Ph.D., F.R.S.C., Dominion Archivist.

Picturesque Portugal—F. J. Alcock, Ph.D., F.R.S.C., Chief Curator, National Museum of Canada.

No Man is an Island—a motion picture in technicolour. Introduced by A. O. Wolff, Consolidated Mining and Smelting Company of Canada.

Servants of the People—Arthur Beauchesne, C.M.G., M.A., K.C., LL.D., F.R.S.C., Ottawa.

The Secret Land and Antarctic Whale Hunt—motion picture program.

The Changing Commonwealth—R. G. Trotter, M.A., Ph.D., D.C.L., F.R.S.C., The James Douglas Professor of History, Queen's University.

Exploring Mexico's Oldest Habitations—Richard S. MacNeish, M.A., Ph.D., Archaeologist, National Museum of Canada.

The Modern Arctic—Y. O. Fortier, Ph.D., Geological Survey.

Power and Fuel Under the Prairies—George S. Hume, O.B.E., Ph.D., F.R.S.C., Director, Mines, Forests and Scientific Services, Department of Mines and Resources.

Here and There in Canada—miscellaneous films shown through the courtesy of the National Film Board.

The Milky Way—Mrs. Helen Sawyer Hogg, A.M., Ph.D., F.R.S.C., Astronomer, David Dunlap Observatory.

Through Western Europe—P. O. Ripley, M.Sc., Ph.D., Dominion Field Husbandman, Experimental Farm Service.

North to the Midnight Sun—Douglas Leechman, B.Sc., M.A., Ph.D., Archaeologist, National Museum of Canada.

New Islands in the Arctic—W. K. W. Baldwin, M.B.E., M.A., Botanist, National Museum of Canada.

A Naturalist in the Arctic—Lieutenant Colonel Niall Rankin, F.R.P.S.

Children's Lectures

Elephant Boy—motion picture program.

My Seeing Eye Dog—Mrs. David Crombie, Westmount, Que.

A Story About Insects—Stanton D. Hicks, Department of Agriculture.

Animals and Birds in Newfoundland—Austin W. Cameron, National Museum of Canada.

Children of Other Lands, Britain—in collaboration with the Citizen's Committee for Children, Ottawa.

Snakes, Frogs, and Turtles—Clyde L. Patch, National Museum of Canada.

Children Around the World—Dr. Richard S. MacNeish, National Museum of Canada.

Arctic Explorers—Dr. Y. O. Fortier, Geological Survey.

Down to the Sea at Fundy—Dr. F. J. Alcock, National Museum of Canada.

Selected Short Subjects—motion picture program.

Come a Singing—Miss Margaret Sargent, National Museum of Canada, assisted by Mrs. Marjorie Butterworth and pupils of Glashan School.

Let's Go To Europe—Dr. P. O. Ripley, Department of Agriculture.

Mystery Islands in the Arctic—W. K. W. Baldwin, National Museum of Canada.

North to the Midnight Sun—Dr. Douglas Leechman, National Museum of Canada.

The assistance of the Boy Scouts, Sea Scouts, and Commissionaires in looking after the large number of children who come to the museum lectures on Saturday morning is greatly appreciated by the Lecture Committee.

Particular acknowledgment is made of the co-operation of the local press in reporting the various lectures, and of the Ottawa Public Library in selecting and providing lists of books related to the subjects of the lectures for supplementary reading.

Lecture Hall

Among the scientific and related organizations granted the use of the Lecture Hall were the Royal Astronomical Society, the Canadian Geographical Society, the Ottawa Fish and Game Association, the Scientific Film Society, and the Ottawa Field Naturalists Club.

Photographs

Prints to illustrate scientific publications, textbooks, and magazine and newspaper articles were selected from the large collection of photographs taken by officers of the National Museum. Requests for these photographs were received from Canada, the United Kingdom, the United States, and European countries.

Publications

An increasing number of educational and scientific institutions found museum publications of value, and encouraged students and others to make full use of this material. Distribution of museum publications was in excess of 30,000.

Visual Aids

Considerable museum material on anthropology, biology, and other phases of the natural history of Canada went to teachers, students, and other persons in all parts of Canada. This material is lent free of charge to educational institutions in Canada except for cost of transportation one way.

Archaeology

Field Work

Douglas Leechman was engaged in field work from May to September. He first visited Winnipeg where a large bone implement made from the fibula of a prehistoric elephant had been found. He examined the site and was successful in collecting specimens which may possibly be associated with this find. He then proceeded to the central part of British Columbia in the vicinity of Stuart and Fraser Lakes. Ten or 15 sites were examined and a large collection of chipped stone implements was secured. Comparison of this material with that from other sites of the western plains is now being undertaken. From there he proceeded to Southern Yukon where he examined other sites of the culture first discovered by Frederic Johnson in 1944. At the northern end of Lake Bennett several sites were examined on an old soil surface recently re-exposed by the migration of sand dunes which had previously covered them. These were well below a layer of volcanic ash, which is believed to have fallen about 500 A.D.

At Boundary Bay, about 20 miles south of Vancouver, Dr. Carl Borden, archaeologist at the University of British Columbia, directed the excavation of a kitchen midden. The field party was made up of students from the University of British Columbia, the University of Washington, and the University of Toronto. Dr. Leechman spent 10 days at this site. A 5-foot trench was cut through the midden which, at this point, was 75 feet wide and 12 feet deep. Its total length is approximately 500 yards. Thirteen burials were found, six of them juvenile. In the case of one, a child of about twelve, both hands had been removed just above the wrists before burial. About 380 artifacts, both chipped and ground stone tools, were found as well as artifacts of bone and shell. Preliminary impressions suggest that the stratification will reveal cultural sequences. Most of the artifacts and burials were found on the west side of the midden. It is hoped to continue work at this site in 1950.

From September 5 to 12, Dr. Leechman attended the Congress des Americanistes in New York; on October 15, he attended the session of the Canadian Museums Association in Ottawa; from November 15 to 21, he was at the annual convention of the American Anthropological Association in New York.

Richard S. MacNeish, from June 22 to the end of August, was engaged in an archaeological survey in the Northwest Territories. He examined three areas—east of Great Slave Lake, northeast of Lake Athabasca, and the Mackenzie River from Fort Providence to Norman Wells. He travelled about 9,000 miles, found 40 sites, and collected about 200 artifacts, subsequent study of which showed that there are five distinct cultures in the first two areas investigated. The sites and artifacts found in the Mackenzie area show its importance and the necessity for future work there.

During the last two weeks of November, he visited collectors at Buffalo, Ann Arbor, Toronto, and a number of places in southern Ontario, to supplement his information on Iroquois pottery.

Dr. Henry B. Collins, Jr., of the Smithsonian Institute, Washington, D.C., undertook the excavation of an Eskimo site on Cornwallis Island (Lat. 75°, Long. 95°) where he found abundant Thule material. In the lower

levels, animal material such as mittens, boot soles, skin, and gut were well preserved. A type of lamp in which pottery sides were added to a limestone slab base was found. There was no trace of Dorset material.

Under the direction of Dr. Leechman, Miss Catharine McClellan, assisted by Miss Dorothy Rainier, both of the University of California, continued ethnological studies of the Interior Tlingit of the Southern Yukon. They worked at Teslin, Carcross, and Klukshu, and collected a large body of data, including photographs, and songs on a wire recorder. Emphasis was laid on social organization, material culture, the effect of Tlingit on the interior Athabaskan people and linguistic changes.

Thomas E. Lee, a student at the University of Michigan, undertook an archaeological survey of the lower peninsula of Ontario. He was primarily interested in the pre-Iroquois horizons of that area. The materials collected from the surface and from test pits indicate the existence of pre-pottery sites, and also sites very similar to those of the Point Peninsula culture of New York and, most important, a number of Owascoid sites, which appear to be directly ancestral to the prehistoric Iroquois (proto-Neutral-Erie-Huron) of that area.

Office Work

In the office, Dr. Leechman studied the material collected in the field and also that presented by various donors. He continued his work on the problem of the migration of man from Asia to America, and other aspects of Canadian prehistory. He examined and reported upon specimens sent in for identification, including skeletal material submitted by the Royal Canadian Mounted Police. He wrote and edited the commentary on two documentary films; the first, entitled *Moose Hide*, shows Indian methods of smoking and tanning hides as practised in southern Yukon, and the second, entitled *Flint Chipping*, shows the method of making the stone tools used by prehistoric man. Both of these were photographed in the field during the summer. He assisted the National Film Board in the preparation of a film strip illustrating North American Indian masks.

Dr. MacNeish worked on the preparation of reports including one written in co-operation with Dr. W. A. Ritchie, entitled *Pre-Iroquois Pottery Types*, which appeared in *American Antiquity*, October, 1949. Other reports completed were: *Archaeology of the Northeast* to be published in the Cole Memorial Volume; *A Synopsis of the Archaeological Sequence of Canyon del Diablo, Taosulipas, Mexico*, in *Revista Mexicana de Anthropologia*, December, 1949; and *Huron Pottery* in bulletin of the Anthropological Association of Toronto, December, 1949. His extensive paper *Iroquois Pottery Types* was finished except for revision and checking. A number of brief communications and progress reports were also prepared. Before writing *Iroquois Pottery Types* it was necessary to study archaeological material from various sites in Ontario. The material collected in the Northwest Territories was studied and a preliminary discussion of it was prepared. About 2,000 archaeological specimens were catalogued and preliminary plans for eight archaeological exhibits were completed. He attended the Congress des Americanistes in New York City, and made plans for his field work in 1950.

Publications

- The Dorset Eskimo Culture*—Douglas Leechman. *Encyclopedia Arctica*. (In press.)
- The Bella Coola Indians* (Review)—Douglas Leechman. *Canadian Historical Review*.
- The Loon's Necklace*—Douglas Leechman. *Fashion Digest*, New York. (In press.)
- Implement of Elephant Bone from Manitoba*—Douglas Leechman. *American Antiquity*. (In press.)
- Pacific Northwest Coast Art* (Review)—Douglas Leechman. *Canadian Art*. (In press.)
- Pre-Iroquois Pottery Types*—Richard S. MacNeish (with W. A. Ritchie). *American Antiquity*, October, 1949.
- Archaeology of the Northeast*—Richard S. MacNeish. *Cole Memorial Volume*. (In press.)
- A Synopsis of the Archaeological Sequence of Canyon del Diablo, Tamaulipas, Mexico*—Richard S. MacNeish. *Revista Mexicana de Antropología*, December, 1949.
- Huron Pottery*—Richard S. MacNeish. *Bulletin of the Anthropological Association of Toronto*, December, 1949.

Lectures

- The Loon's Necklace*—Douglas Leechman. Arctic Associates, Montreal, April 21, 1949. Stoney Creek Reserve, Vanderhoof, B.C., June 11, 1949. Marine Biological Station, Friday Harbour, August 13, 1949.
- The Yukon*—Douglas Leechman. Ottawa Field-Naturalists' Club, December 6, 1949. Quebec Society for the Protection of Birds, Montreal, January 9, 1950. Museum of Fine Arts, Montreal, January 11, 1950. Ottawa Normal School, January 13, 1950.
- Canada's First Immigrants*—Douglas Leechman. (C.B.O. Radio Forum) June 4, 1949.
- Archaeology of Western Canada*—Douglas Leechman. Radio talk, Edmonton, July 1, 1949.
- Indians of the Northwest Coast*—Douglas Leechman. S.S. *Princess Louise*. July 31, 1949.
- North American Indian Origins*—Douglas Leechman. Carleton College History Class. October 17, 1949.
- Teaching Lessons on the Canadian Indian*—Douglas Leechman. School Teachers' Seminar. November 4, 1949.
- Mammoth Bone Implement*—Douglas Leechman. American Anthropological Association, New York, November 18, 1949.
- Movement of Man into the New World*—Douglas Leechman. Anthropology Class, University of Toronto, March 17, 1950.
- Instructional Films in Anthropology*—Douglas Leechman. Graduate Students and Faculty in Anthropology, University of Toronto, March 17, 1950.
- Thule and Dorset Eskimo Cultures*—Douglas Leechman. Anthropology Graduates, University of Toronto, March 18, 1950.

- First Men in the New World*—Douglas Leechman. Royal Canadian Institute, Toronto, March 18, 1950.
- Mexican Archaeology*—Richard S. MacNeish. Y.M.C.A. Luncheon Club, March 24, 1950.
- Co-operation of Geologists and Archaeologists*—Richard S. MacNeish. Logan Club, March 21, 1950.

Ethnology

Field Work

Marcel Rioux spent from July 10 to August 31 on the Grand River Six Nations Reserve studying the social structure of this Iroquois group; on this first trip he concentrated on the Handsome Lake religious group where the ancient culture has been more preserved than in others. Folklore and linguistic materials were also gathered particularly among the Cayugas and the Mohawks.

Miss Helen Creighton continued field studies of the folk-lore and folk-songs of Nova Scotia and turned in a large amount of assembled material.

Miss Carmen Roy continued folk-lore field work in the Gaspé area. She visited many localities and obtained 331 folk-songs, 23 folk-tales, and abundant information on medicine, folk-dances, superstitions, blason populaire, and local legends. She paid special attention to the Jersey group living in Paspébiac and its neighbourhood.

Messrs. Lacourcière and Savard worked in various regions of Gaspé, Beauce, Charlevoix and Joliette counties. They collected 125 folk-songs, 29 folk-tales and 44 legends and anecdotes.

Miss Doyon worked in Beauce and Lévis counties; she collected information on 37 different topics including 810 descriptions and 31 drawings of specimens.

Office Work

During the winter months, Marcel Rioux continued to work on Ile Verte materials and nearly completed the writing of a monograph which will consist of an analytical study of a contemporary peasant society. He also prepared a questionnaire, *Early Childhood Socialization Processes* which will be used in the field by Canadian social scientists. In December, he participated in the panel on Indian research. Besides guiding and instructing field workers who do not report to Ottawa, he classified and catalogued folk-lore materials collected in the field during the summer months.

Miss Josephine Hambleton, who joined the staff of the museum in December 1949, assisted in the preparation for publication of the field-notes and photographs relating to Haida carving in argillite which Marius Barbeau made during numerous visits to the Queen Charlotte Islands. She also conducted research on Eskimo and other Canadian costumes.

Miss Margaret Sargent joined the staff of the museum in April 1949 as a musicologist. She has since been engaged in transferring from perishable wax cylinders to magnetic recording tapes Indian songs collected as far back as 1911. She has also transcribed 225 Huron-Wyandot songs of which 82 will be used in a projected publication, *The Old-World Dragon and the Great Lakes and the St. Lawrence*.

Publications

- L'Évolution de l'anthropologie moderne*—Marcel Rioux, November, 1949.
Le département d'anthropologie du Musée national—Marcel Rioux, CIAP, Paris, April, 1949.
The Meaning and Function of Folk-lore in Ile Verte—Marcel Rioux. *National Museum of Canada, Bulletin No. 118*, 1950.
El Siglo de Oro del Arte del Canada Frances—Woodcarving in French Canada—Josephine Hambleton.—*El Nacional*, Caracas, Venezuela, December, 1949.
Une Arte Indo Canadiense—Haida Argillite Carvings—Josephine Hambleton. *El Nacional*, Caracas, Venezuela, January, 1950.
Los Esquimales—Eskimo Folk-lore—Josephine Hambleton. *El Nacional*, Caracas, Venezuela, February, 1950.

Lectures

- Le concept d'Ethos en Anthropologie culturelle*—Marcel Rioux. ACFAS, Montreal, October 17, 1949.
Le Musée National du Canada—Marcel Rioux, CKCH, Hull, March 14, 1949.

Zoology

Field Work

Field investigations of the birds and mammals of southwestern Yukon Territory were made by W. Earl Godfrey, assisted by Colin L. Thacker and Ian V. F. Allen, Haney, B.C. Altogether 412 birds, 98 mammals, and two amphibians were collected, detailed notes were made, and habitat photographs and motion pictures were taken.

Austin W. Cameron, accompanied by J. Sherman Bleakney, Marshall H. Ronalds, and Lloyd A. Duncanson collected mammal and bird specimens in southern and central Newfoundland during the period June 1 to August 20.

Mr. Cameron spent the period October 5 to 8 in Gaspé County, Quebec, where he examined the skull of a Greenland Bowhead whale (*Balaena mysticetus*) unearthed at Ste-Anne des Monts. This specimen is of unusual biological interest because it extends the known range of this species some 1,200 miles to the south.

A party composed of Charles O. Handley, Jr., representing the Smithsonian Institute, Washington, D.C., and Stuart D. MacDonald, National Museum of Canada, studied the birds and mammals of remote Prince Patrick Island, N.W.T., for their respective institutions from April 19 to October 12. Base camp was at the Mould Bay weather station. Mr. MacDonald's collection for the National Museum of Canada numbered 207 birds and 122 mammals, and he brought back notes, habitat photographs, and a small collection of plants, fossils, and animal parasites.

Office Work

Clyde L. Patch devoted considerable time to supervision and instruction. Amphibians and reptiles were identified, inquiries regarding herpetology were replied to, and additional manuscript was prepared

for a proposed publication on the herpetology of Canada. An illustrated paper on the Canadian beaver was prepared for museum publication. Six copies of a meteor were cast and coloured for the Dominion Observatory.

Birds and mammals were prepared for museum and loan purposes and the construction of three mammal group models was started.

W. Earl Godfrey continued research on the taxonomy and distribution of the birds of Canada. He completed and submitted for publication a 359-page manuscript on the birds of western Saskatchewan and a 51-page report on the birds of southern Yukon Territory. A taxonomic study of the brown-headed chickadee was continued with study of additional material from critical localities. The work is almost complete.

Austin W. Cameron continued research on the taxonomy, distribution, and ecological relationships of Canadian mammals. Laboratory research included taxonomic studies of the chipmunk, genus *Tamias*, and of recently acquired mammal material from northern Quebec and southern central Saskatchewan. The Saskatchewan study has been brought almost to completion but additional material is required from a number of critical localities. Two papers, *The Mammals of the Lake Mistassini and Lake Albanel Region, Quebec* and *A New Chipmunk from Ontario and Quebec* have been prepared and submitted for publication. A series of popular leaflets dealing with mammals represented in the habitat groups in the museum exhibition halls are in course of preparation.

Claude E. Johnson completed the fox group background and the installation of accessories. He made preliminary designs for murals to be painted on the panels above the glasses of the large mammal groups, and is now engaged on the mural over the wood buffalo group.

Accessions

There were large accessions to the collections. One important group that requires special mention includes 350 birds and 240 mammals collected by T. H. Manning, leader of the Geographical Bureau expedition to Hudson Bay and Foxe Basin.

Publications

- Further Northern Records of the Wood-frog*—Clyde L. Patch. *Copeia*, 1949, No. 3, September 15.
Birds of Lake Mistassini and Lake Albanel, Quebec—W. Earl Godfrey. *National Museum of Canada Bull. 114*, Biol. Ser. 38, 1949, pp. 1-43, 6 plates, 1 map.
European Starling Reaches the Pacific Coast—W. Earl Godfrey. *Canadian Field-Naturalist*, 1949, vol. 63, No. 4, p. 165.
Zoological Investigations in Western Saskatchewan—W. Earl Godfrey. *Annual Report of the National Museum, Fiscal Year 1948-1949*, *National Museum of Canada, Bull. 118*, 1950, pp. 93-94.
Four Reviews of Current Literature—W. Earl Godfrey. *Canadian Field-Naturalist*, 1949, vol. 63, No. 2, p. 92; No. 3, p. 118, and No. 6, p. 241.
Two Reviews of Current Literature—W. Earl Godfrey. *Bird-Banding*, 1950, vol. 21, pp. 26-27 and 33.
The Mammals of the Lake St. John Region, Quebec—Austin W. Cameron and Phillip A. Orkin, *Annual Report of the National Museum, Fiscal Year, 1948-1949*, *National Museum of Canada, Bull. 118*, 1950, pp. 95-108.

Lectures

- Turtles*—Clyde L. Patch. Lady Sherwood Cadets, St. John's Hall, Ottawa, November 7.
- Backstage in a Museum*—Clyde L. Patch. Home Arts Club, Y.W.C.A., Ottawa, March 8.
- The National Museum's Bird Collection*—W. Earl Godfrey. The Ornithology Section of the Ottawa Field-Naturalists' Club, National Museum, December 3.
- Summer in the Yukon*—W. Earl Godfrey. Ornithology Section of the Ottawa Field-Naturalists' Club, February 3.
- Newfoundland Wildlife*—Austin W. Cameron. Ottawa Field-Naturalists' Club, January 19.

Vertebrate Palaeontology

C. M. Sternberg supervised the work in vertebrate palaeontology and reported on vertebrate fossils sent in for identification. He continued studies of the vertebrate collections with special emphasis on three fine skeletons of the small primitive horned dinosaur, *Leptoceratops*. A description of this interesting genus was prepared for publication. A panel mount of a hooded duck-billed dinosaur was finished and will be loaned to the University of British Columbia.

National Herbarium

Field Work

A. E. Porsild, Chief Botanist, as a member of a party sponsored jointly by the Arctic Institute of North America, the Geographical Bureau, and the National Museum, during July and August carried out botanical reconnaissances on Great Bear Lake and on Victoria and Banks Islands, N.W.T. The party, besides Mr. Porsild, included Dr. A. L. Washburn, Executive Director of the Arctic Institute of North America, Mrs. A. L. Washburn, and J. L. Jenness of the Geographical Bureau. The party operated from an advance base on Holman Island Post, Victoria Island, using a chartered aircraft on floats. The season of 1949 was unusually late and aircraft on floats were unable to land on Victoria Island until the end of July; on August 23 sharp frost and new snow stopped the collection of plants. Although landings were made at a number of places on Banks and Victoria Islands, in only one or two places were the stops long enough for detailed botanical collecting. Nevertheless, at the end of the short season the total number of flowering plants and ferns known to occur on Banks Island had been increased from 65 to 174 and that of Victoria Island from 106 to 201 species. The collections of plant specimens were supplemented by Kodachromes, black and white photographs illustrating floristic and physiographic features, and by copious notes on matters related to the flora, fauna, and physiography of the islands.

H. J. Scoggan led a field party during June, July, and August in a botanical survey of the water route extending along the Nelson, Echimamish, and Hayes Rivers from Norway House off the north end of Lake Winnipeg to York Factory on Hudson Bay. The return trip was made by ascending the Nelson River to Limestone Rapids, where the party entrained for Wekusko. The last part of the season was spent in the

area of Wekusko Lake and Tramping Lake. Cryptogams and vascular plants collected numbered 1,859, enough material in each case to make up six herbarium mounts. In general, collections were made to illustrate ecological habitats, and photographs were taken to show general topography and vegetation types. A collection of birds and small mammals was turned over to the Zoological Division for study and identification.

W. K. W. Baldwin took part in an expedition to Hudson Bay and Foxe Basin led by T. H. Manning and sponsored by the Geographical Bureau. Leaving Ottawa on June 11, he joined the expedition which sailed from Moosonee in the *Nauja*, a 50-foot boat built especially for the expedition. In addition to 650 collections of flowering plants and ferns representing about 370 species and totalling 2,700 herbarium mounts, Mr. Baldwin made a collection of crustaceous lichens, arctic seeds, and insects, and made numerous photographs of both botanical and geographical interest. He returned to Ottawa on October 11.

Office Work

A. E. Porsild completed final revision of the typescript of his *Botany of Southeastern Yukon* which was submitted for publication, but not printed, the previous year. He prepared for publication a 50-page revision of the genus *Antennaria* in northwestern Canada and a shorter paper describing five new *Compositae* from the Yukon, and spent considerable time on the preparation of an annotated catalogue of the flowering plants and ferns of Keewatin and Mackenzie Districts. He also prepared preliminary reports on his botanical investigations of Banks and Victoria Islands, edited and checked four reports on forest botanical field work carried out in Ungava and Hudson Bay in 1948 and 1949 by Dr. I. Hustich of Helsingfors, Finland, and wrote several book reviews and short articles. He named 5,834 plants of which 863 were submitted for identification and report by other Government departments or by Canadian and foreign universities and botanical institutions. He checked 8,355 mounted specimens before insertion in the National Herbarium and selected 6,505 duplicate specimens for distribution to other herbaria on exchanges. During the year he wrote 322 letters and memoranda in response to requests for technical information or on matters dealing with the administration of the herbarium.

H. J. Scoggan prepared for publication a 19-page report on the 1948 botanical surveys of the Norway House-Cross Lake and northern Lake Winnipegosis areas of central Manitoba. He checked the galley and page proofs of his flora of the Gaspé Peninsula, (399 pages, 1 map, 8 plates). A card index of about 3,000 cards were assembled to serve as the framework for a proposed flora of Manitoba. In this have been listed, with relative data, all Manitoba specimens in the National Herbarium, and in the herbaria of McGill University, the University of Montreal, and the Oka Agricultural College. Also listed are pertinent citations in various botanical periodicals and monographs. An index of about 800 cards containing references to the botanical literature was also assembled.

Dr. Scoggan organized the field party sent by the National Museum to northern Manitoba, and on his return submitted reports on such items as accounts and equipment. He named the 1,721 vascular plants collected during the summer, arranged them for mounting and exchange, and drew up plans for the 1950 field season in northern Manitoba. He named a collection of plants made by M. O. Malte in 1926 in New Brunswick and

Prince Edward Island, comprising 905 numbers, as well as smaller collections made by Malte in Ontario, Alberta, and British Columbia. Other collections named were: I. Hustich, 110 numbers from Knob Lake, Labrador; W. Krivda, 125 numbers from The Pas, Manitoba; P. H. du Boulay, 25 numbers from Ontario and Manitoba; and R. Nolet, 14 numbers from Ontario. The period November 7 to 19 was spent in Montreal making card index entries of Manitoba plants in the herbaria of McGill University, the University of Montreal, and the Oka Agricultural College. Seven hundred and forty-eight sheets of plants were brought back for critical study. He wrote 90 letters in connection with herbarium work and assisted at several of the programs under the direction of the Museum Lecture Committee, and at meetings of the Macoun Field Club.

W. K. W. Baldwin prepared a summary report on the botanical work of the Foxe Basin Expedition for publication in the *Annual Report of the National Museum* and spent considerable time arranging and naming the plants collected. He prepared notes and reports on his collection of seeds, lichens, and insects as well as on 250 photographs for the records of the Geographical Bureau and members of the expedition. He assisted in editing a motion picture film of the expedition made by D. B. Coombs. He also prepared lists and notes from the 1947 expedition to James and Hudson Bays for the use of Dr. I. Hustich and for J. Kucyniak. He conducted the spring, autumn, and winter programs of the Macoun Field Club involving 40 meetings and excursions and wrote an account for publication of the organization and development of this club experiment. He was responsible for the filing of mounted specimens in the herbarium and for the selection of plant material requested on loan by other botanical institutions.

Accessions, Loans, and Exchanges

The National Herbarium received 2,304 specimens by exchange, 683 by donation, and approximately 14,295 from field work by members of the staff. Nine hundred and seventy-three specimens were loaned to and 924 specimens were borrowed from other botanical institutions. In continuation of exchanges, 9,501 duplicate specimens were distributed to other herbaria in Canada and abroad. In the herbarium, 8,355 specimens were mounted and inserted, bringing the total of numbered specimens in the National collection to 206,700.

Among the notable accessions is a complete set, numbering 1,617 beautifully prepared specimens of G. Samuelsson: *Plantae Sueciae Exsiccatae*, received by exchange from the Swedish National Museum, Stockholm; and by donation, a collection numbering about 2,000 specimens of rare and critical Greenland plants collected by A. E. Porsild during the years 1940-1943 when, on loan to the Department of External Affairs, he was stationed in Greenland as Canadian Consul.

Publications

A New Antennaria from Northern Ungava—A. E. Porsild. *Canadian Field-Naturalist*, 63: 80-81 (1949).

Dowlingia Laeta Green and Megalodonta Beckii (Torr.) Greene from British Columbia—A. E. Porsild. *Canadian Field-Naturalist*, 63: 116 (1949).

Report on Health Conditions in Greenland (Review of Danish Official Report)—A. E. Porsild. *Arctic Circular* 2: 53-55 (1949).

The Genus Antennaria in Northwestern Canada—A. E. Porsild. *Canadian Field-Naturalist*, 64: 1-25 (1950).

Five New Compositae From Yukon—Alaska—A. E. Porsild. *Canadian Field-Naturalist*, 64, 43-45 (1950).

A Biological Exploration of Banks and Victoria Islands—A. E. Porsild. *Arctic Circular* 3: 1-9 (1950).

Families of Flowering Plants—H. J. Scoggan. *Canadian Nature*, May-June, 86-88 (1949); September-October, 114-116 (1949).

Chestnuts—H. J. Scoggan. *Canadian Nature*, September-October: 104- (1949).

Botanical Investigations in Central Manitoba—H. J. Scoggan. *National Museum of Canada Bulletin* No. 118, 84-92 (1950).

Botanical Investigations on the East Coast of James and Hudson Bays—W. K. W. Baldwin. *National Museum of Canada Bulletin* No. 113, 31-32 (1949).

Return of the "Nauja"—W. K. W. Baldwin. *Domar*, December, 26-28 (1949).

Lectures

Canada's Reindeer—A. E. Porsild. Devonshire School, February 1, 1950, at Ottawa.

Plantlife in the Arctic—A. E. Porsild. Arctic Circle, Ottawa, February 9, 1950.

The Flora of the Gaspé Peninsula—H. J. Scoggan. Province of Quebec Society for the Protection of Birds, February 13, at Montreal.

Expedition to East Coast of James and Hudson Bays—W. K. Baldwin, Trinity College School, Port Hope, May 18, 1949.

Lands Division

The Lands Division is responsible for the administration of all federal lands, minerals, and timber in the Northwest Territories and the Yukon. Throughout the provinces it also administers Ordnance and Admiralty lands not required for defence purposes; public lands; lands reserved to Canada under the transfer of natural resources; unpatented federal lands on the security of which loans under the Soldier Settlement Act were made and certain mining rights reserved by virtue of Section 57 of the said Act. A Central Office of Record is maintained in which are recorded plans and relevant information pertaining to federally owned or controlled lands, and a record of seed grain, fodder, and relief advances made by the Federal Government to settlers in the western provinces. In this latter connection the division works in conjunction with the provinces concerned in the adjustment or apportionment of accounts. Letters Patent are prepared and issued in connection with federally controlled lands administered under the Dominion Lands Act.

Greatly increased efficiency in the functioning of the division has resulted from the establishing, on March 1, of all head office sections of the division in the Vimy Building, 370 Sparks Street, Ottawa.

Northwest Territories

Mining

The value of mineral production in 1949 rose to an all time high of \$6,868,301 an increase of more than 50 per cent over the previous year. The Yellowknife River Valley area continued to be the centre of gold mining activity in the Territories and three of the four mines producing at the beginning of the year, Con-Rycon, Negus, and Giant showed favourable gains. One mine, Thompson-Lundmark, closed down but another, Discovery Yellowknife, began milling January 1, and poured its first brick in February.

Great interest was shown in the intensive exploration program being carried on by Consolidated Mining and Smelting Company of Canada Limited and Ventures Limited on the 500-square mile Pine Point Concession on the south shore of Great Slave Lake. About 18,000 feet of diamond drilling was done and more than 80 miles of road as well as a new airstrip were built. As required by Order in Council P.C. 1004 the concessionaires surrendered one-half of the concession on March 23, retaining an irregularly shaped parcel running from east to west through the concession. Expenditures by the two companies were considerably in excess of those required under the terms of the concession.

On Parcel "A" of Pine Point Reservation No. 2 the American Metal Company of Canada Limited completed 13,338 feet of diamond drilling and built about 20 miles of roads. On Parcel "D" the Consolidated Mining and Smelting Company of Canada Limited completed more than 8,000 feet of diamond drilling and built about 38 miles of roads. Expenditures by both these companies amounted to more than was required during the first concession year.

The Indian Mountain Lake area was the most active for prospecting and field parties. Hollinger completed about 8,000 feet of diamond drilling on the "BB" group of mineral claims as well as geophysical mapping but failed to make the second payment due in November under the terms of their option from J. McAvoy.

Yellorex Gold Mines Limited adjoining Negus on the south completed 17,422 feet of drilling to test the southern extension of the Campbell shear zone. Canus Petroleum Corporation optioned the "IC" group of claims at Prelude Lake (where a rich showing was discovered last year) and did some geological mapping and drilling. Bulldog Yellowknife Gold Mines Limited in the McKay-Courageous Lake area proved good values of considerable extent in the sulphide zone, supplementing the ore already proven in the Mathews vein. North Inca Gold Mines Limited at Indin Lake diamond drilled and mapped its property on the surface and underground. Progress Diversified Minerals Limited, adjacent to North Inca on the north, deepened its shaft an additional 316 feet to a total depth of 495 feet. The second and third level stations were cut and diamond drilling was performed from the bottom of the shaft to intersect the ore zone. A new company, Indigo Consolidated Gold Mines, Limited, was formed during the latter part of the year to take over the ground held by Progress Diversified at Indin Lake. Six thousand seven hundred and sixty-five feet of drilling was done on the Hope Group of mineral claims on Hope Island, and further drilling was commenced on the old Philmore property on Outpost Island in February, the latter property having been taken over by a new company, Marwood Mining Corporation Limited.

Volcanic Yellowknife Gold Mines Limited reported a new uranium find in the Marian River district. The extent of the showing is not known but so far it has been traced for about 260 feet. The interests of International Uranium Limited, which did some underground work between May and July, were taken over by a new company, Acadia Uranium Mines Limited. Eldorado Mining and Refining (1944) Limited, a Crown Company, continued operations at Port Radium.

Don Cameron Explorations Limited prospected in the Otter Lake area, Arctic and Hudson Bay Mining District, and staked 12 claims one of which was recorded as a discovery claim.

Producing Mines

The Con-Rycon Mine, about one mile south of Yellowknife and operated by the Consolidated Mining and Smelting Company of Canada, Limited, maintained its mill rate at about 300 tons per day. Although dropping to second place as a producer, production for 1949 was 59,631 fine ounces of gold compared to 55,252 fine ounces for 1948. The main shaft was sunk to a depth of 2,460 feet and considerable development work was carried out on the lower levels. All production came from above the 14th level.

The Negus Mine, adjoining Con-Rycon on the south, milled at about 180 tons daily, with production coming from the Campbell shear zone between the 11th and 13th levels. A scavenger flotation process in the mill produced 10 to 12 tons of sulphide concentrate per day. This concentrate averaged more than one ounce per ton and was stockpiled for processing at a later date. Production for 1949 was 23,862 fine ounces compared to 23,303 fine ounces for 1948.

Giant Yellowknife Gold Mine, about three miles north of Yellowknife, brought its roaster plant into operation early in the year. The tonnage milled was increased from 250 tons per day in 1948 to more than 400 tons per day at the end of the fiscal year and the mine became the leading producer in the Territories. All mining was controlled from No. 2 shaft which was 780 feet deep but No. 3 shaft was sunk to a depth of 611 feet and surface buildings to service it were completed. Production for 1949 amounted to 88,971 fine ounces of gold compared to 8,152 fine ounces for 1948. It should be noted that the tremendous increase in production over 1948 was partially due to the concentrate stockpile which accumulated prior to the roaster plant going into operation. The stockpile was processed with current mine production and was exhausted late in the summer.

The Discovery Yellowknife Gold Mine situated about 55 miles north of Yellowknife commenced milling about January 1, and by March 31 was milling at the rate of about 80 tons per day. The shaft was completed to a depth of 376 feet and the grade of ore was found to be higher than had been expected.

Thompson-Lundmark ceased underground operations and closed down their mill in April due to lack of ore. Surface geological work and diamond drilling was done during the summer but as no further information of interest was obtained the mine was completely closed and the equipment sold.

Coal, Petroleum, and Natural Gas

Four annual permits were issued under the Domestic Coal Regulations, and one permit, issued under the Regulations for the Disposal of Petroleum and Natural Gas Rights, the Property of the Crown in the Northwest Territories and Yukon, was cancelled. At the close of the fiscal year four applications for permits to explore under the latter regulations, each covering an area of 64,000 acres in the vicinity of Fort Providence, were being considered.

Production from the "Proven Field" at Norman Wells amounted to 151,035 barrels.

Revenue

Revenue derived from mining in the Northwest Territories amounted to \$91,239.92 made up as follows: Coal leases \$49.50; coal permits \$20.00; coal royalty \$17.50; mining licences \$30,170.60; petroleum and gas permits \$250.00; petroleum and gas leases \$1,733.33; quarrying leases \$26.67; quartz mining fees \$43,364.17; quartz mining leases \$3,997.70; quartz royalty \$9,936.58; sale of maps \$2.00; sale of claim sheets \$435.95; petroleum and gas surface leases \$963.21; quartz mining surface leases \$269.96; sundry items \$2.75.

Value of Mineral Production

	1947*	1948*	1949*	Total Production to End 1949
	\$	\$	\$	\$
Gold.....	2,188,095	3,556,875	6,389,748	27,339,022
Silver.....	32,655	19,036	52,350	946,677
Lead.....				490
Copper.....				24,102
Tungsten.....				37,674
Crude Petroleum.....	500,238	676,574	353,108	3,348,416
Natural Gas.....		15,000	6,523	25,118
	2,720,988	4,267,485	6,801,729	31,721,499

* 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, 911 miners' licences and renewals were sold, 1,790 quartz grants were issued, and 2,102 assignments of mineral claims were recorded. In addition, 31 leases comprising 1,594.57 acres were issued under the Quartz Mining Regulations.

Lands and Timber**Land Sales**

Seventeen sales were effected, the following settlement lots being sold: Aklavik, 5; Hay River, 10; Fort Smith, 1; Rat River, 1.

Leases and Permits to Occupy

There are now 807 leases and permits to occupy in force in the Northwest Territories. Of this number, 566 are for land in Yellowknife Settlement, with the balance at various other points. These leases and

permits are of the following types: residential and business purposes, 744; agricultural leases, 14; fur farm leases, 10; grazing leases, 4; water-front leases, 32; dock site, 1; fishing site, 1; shipyard, 1.

Forty of the leases were issued to veterans applying for assistance under the Veterans' Land Act; 38 of these are at Yellowknife and one each at Fort Smith and Aklavik.

Assignments

Fifty-nine assignments affecting leases were registered in the department.

Hay Permits

Two hay permits were issued under which 80 tons of hay were cut.

Timber

One hundred and forty-seven timber permits, excluding those for commercial timber berths, were issued in the Northwest Territories. These permits authorized the cutting of 24,000 board feet of lumber, 31,856 linear feet of timber, and 6,517 cords of fuelwood. Twenty-seven of these permits were issued free of dues to religious, educational, and charitable institutions and 12 free permits were issued to Government departments.

There were 14 commercial berth permits issued under which 2,357,687 board feet of lumber was manufactured and 31,678 linear feet of timber and 2,853 cords of fuelwood cut.

There were no timber seizures.

Surveys

In order to facilitate the development and disposal of land, surveys were made during the summer of 1949 at the following points: Hay River, Norman Wells, Fort Good Hope, Arctic Red River, Fort McPherson, Aklavik, Port Brabant, Reindeer Station, Rocher River, Thompson Landing (McLeod Bay), Snare River, Fort Simpson, Fort Franklin, and Fort Norman Settlement.

Revenue

The revenue derived from timber was \$13,834.48. The revenue received from lands, grazing, and hay was \$28,924.07.

The total revenue received from lands, timber, grazing, and hay was \$42,758.55.

Yukon Territory**Mining**

The value of mineral production in Yukon Territory during 1949 amounted to \$4,991,200 compared to \$4,265,910 for 1948. This increase was mainly due to the gold production, which was 78,577 fine ounces, an increase of 17,963 fine ounces over 1948. Placer operations in the Dawson Mining District continued to be the principal source of gold while base metal activities were centred on Galena Hill in the Mayo District.

Interest in prospecting under both the Yukon Quartz Mining Act and the Yukon Placer Mining Act remained at about the same level as the previous season. During the fiscal year 57 grants, 1,893 renewal

grants, and 47 prospecting leases were issued under the Placer Mining Act. Under the Quartz Mining Act 491 grants were issued and 929 grants renewed.

The program of mineral claim surveys which began in 1948 was continued with the result that 91 claims were surveyed in the Mayo Mining District.

Placer Mining

Yukon Consolidated Gold Corporation Limited, the largest producer of placer gold in the Territory and operating eight dredges in the Dawson Mining District, increased its recovery of gold and silver from 47,649 fine ounces of gold and 10,027 ounces of silver in 1948 to 59,065 fine ounces of gold and 12,918 ounces of silver in 1949. The average number of employees on the pay roll of this company during the 1949 season was 265, with a maximum of 451, as compared to an average of 350 and a maximum of 560 in 1948.

Yukon Gold Placers Limited operated three dredges, one on Henderson Creek, one on Thistle Creek, and one on Clear Creek. The latter dredge worked under the name of Clear Creek Placers Limited, a subsidiary of Yukon Gold Placers Ltd. These three dredges together recovered 10,261 fine ounces of gold and 2,841 ounces of silver.

Yukon Placer Mining Company carried on operations by bulldozer method on ground controlled by Yukon Explorations Limited, which company was in receivership. The dredge erected by Yukon Explorations Limited was not operated in the 1949 season.

Other placer operations in the Dawson Mining District included Miller Creek Placers on creek claims Nos. 11 to 20 above Discovery on Sixtymile Creek, Bedrock Mining Company on Bedrock Creek in the Sixtymile area, Reno Gold Mines Limited on Canada Creek, Bert Bratsberg on Gold Bottom Creek, John King on Blanche Creek, Cole Brothers on Homestake Gulch, a tributary of Upper Bonanza Creek, T. Gustafson on Moore Creek in the Fortymile area, and L. C. Bradbury and J. C. Cooper on Little Gold Creek, a tributary of Sixtymile Creek.

In the Whitehorse District, Kluane Dredging Company and Burwash Mining Company were the principal operators.

Quartz Mining

The Mayo Mining District remained the centre of lode mining in the Yukon.

United Keno Hill Mines Limited, operating mines on Galena Hill and the largest producer of base metals in the Territory, lost its mill by fire on June 11 and all underground operations were suspended until October when a new 250-ton capacity mill was completed. Notwithstanding this fact the company milled 29,494 dry tons producing 6,056 tons of concentrates during 1949 as compared to 37,593 dry tons milled and only 5,638 tons of concentrates in 1948.

The main production was obtained from the Calumet-Hector Mine while development work was carried on in the Elsa and No Cash Mines. It was expected that the Birmingham Mine would be reopened in 1950.

Consolidated Yukeno Mines Limited, a new company, acquired all the properties and options held by Silver Basin Yukon Mines Limited,

Yukon Galena Hill Mines Limited, and Yukeno Silver and Lead Mines Limited but did very little work during the year. This company also held options on McLeod's "Keno" Group, the "Chief" Group, and "Rio" Group on Galena Hill; the Fisher estate Mineral Claims in Silver Basin; and McKay's "Highlander" Group on Keno Hill.

East Bay Mining Company commenced a small operation on Philipovich's "Cream-Jean" Group but abandoned it after about six weeks' work. Mayo Mines Limited acquired the "Ram" claims on Sourdough Hill, two claims on Galena Hill, and a group of eight claims on Cobalt Hill.

Other companies active during the year included Hudson Bay Exploration and Development Company and Noranda Mines Limited.

Coal Mining

The Yukon Coal Company Limited continued operations at their Tantalus Butte Mine producing 3,158 tons of coal of which 2,553 tons were sold for consumption at Dawson, Mayo, and Whitehorse.

Leases

There were 74 quartz mining leases in good standing at the end of the fiscal year, 15 of which were issued during the year. Four hydraulic mining leases issued under regulations which were rescinded by Order in Council dated February 2, 1904, were still in force and six coal mining leases were in good standing.

Revenue

Revenue derived from mining in the Yukon Territory amounted to \$154,038.55 made up as follows: Coal leases \$3,831.11; hydraulic leases \$2,390.00; placer mining fees \$70,578.00; placer gold royalty (export tax on gold) \$39,321.83; quartz mining fees \$13,671.62; quartz mining leases \$1,600.00; quartz royalty \$13,644.99; survey fees \$9,000.00; and sale of maps \$1.00.

Value of Mineral Production

	1946	1947	1948	1949	Total Production to End 1949
	\$	\$	\$	\$	\$
Gold ¹	1,664,260	1,671,075	2,121,490	2,950,920	220,556,589
Silver ²	26,124	267,877	1,288,964	1,160,327	23,738,226
Lead.....	3,520	156,556	829,599	846,312	6,222,071
Copper.....					2,711,695
Coal.....			25,857	29,382	858,431
Tungsten.....					18,315
Antimony.....					173
Zinc.....				112,235	112,235
Totals.....	1,693,904	2,095,508	4,265,910	5,099,176	254,217,735

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.

Lands and Timber

There were 33 land sales in Yukon Territory comprising 70 lots in the following settlements: Dawson, 10; Whitehorse, 27; Mayo, 7; Selkirk, 6; Keno, 11; and Marsh Lake, 9.

Leases and Permits to Occupy

There are 105 leases and permits to occupy in effect in Yukon Territory. These privileges are of the following types: residential and business, 69; agricultural, 9; waterfront, 25; and grazing, 2.

There are 46 agreements of sale in force in Yukon Territory by which the veteran applicants are able to secure assistance under the Veterans' Land Act. Under the terms of these agreements the Crown takes title to the land from the veteran for a nominal payment, and at the end of the 10-year term the land is transferred to the veteran for the same amount.

Two leases were issued to veterans for the same purpose.

Timber

Two hundred and seventy-six permits, excluding those for commercial berths, were issued in Yukon Territory, authorizing the cutting of 14,320 linear feet of timber and 25,730 cords of fuelwood. No permits for sawn lumber were issued. Fifteen of these permits listed above were issued free of dues to religious, charitable or educational institutions, and eight were free permits for Government departments.

There were permits issued for 14 commercial timber berths under which 1,692,689 feet board measure of lumber was manufactured and 103,307 linear feet of timber and 2,097 cords of fuel cut.

There was one timber seizure.

Land Surveys

Miscellaneous land surveys were carried out in Yukon Territory during the 1949 field season at the following locations: Whitehorse, Robinson Station, Rainbow Lake, Marsh Lake, Burwash Landing, Haines Junction, Homestead Nos. 143 and 144, Experimental Station for Department of Agriculture, and a forty-acre parcel of land at Pine Creek.

Revenue

Revenue received from timber during the year was \$20,418.06.

The total revenue derived from lands and timber during the year was \$33,938.20.

Disposal of Land

Yukon Territory

Only lands which have been surveyed may be sold and the maximum area to be sold to a person in any one locality is 160 acres. Surveyed lots in townsites, settlements, and subdivisions may be disposed of by private sale or by tender. No land may be sold which, in the opinion of the Local Forestry Officer, contains valuable timber.

Leases

Leases are issued for land in Yukon Territory for a term of not more than ten years, with the privilege of renewal at the discretion of the Minister. The types of leases are: surface, waterfront, agricultural, fur farm, grazing, and miscellaneous. Two other forms of land privilege are Licence of Occupation and Permission to Occupy, both of these being for a term of one year with renewal privileges. Waterfront property can be obtained on lease only and is not sold.

Northwest Territories

The sale of land in the Northwest Territories is subject to the same restriction as in the Yukon, that is it must be surveyed, and waterfront property is not sold, whether surveyed or not.

Leases

Leases are issued under terms similar to those which apply in the Yukon, with the exception of Yellowknife, where the usual term is for 21 years. In some of the settlements an applicant desiring to purchase a surveyed lot is first required to occupy the land for one year under a Permission to Occupy, and disposal by sale is then considered after a satisfactory building has been erected. This is designed to curb speculation and promote orderly development in the settlements. In a few cases, where lots in Yellowknife are in a strategic location for business purposes, and more than one person has applied for the same land, the right to lease is advertised for tender.

Mineral Rights in the Provinces

The department shared to a small extent in the oil boom which was active in the western provinces, particularly Alberta.

The mineral rights in 35 former Soldier Settlement properties in Alberta, four in Saskatchewan, 14 in Manitoba, and nine in Ontario, totalling approximately 8,540 acres, were cleared to the administration of the department by the Department of Veterans Affairs. The Crown's titles to these were verified and tenders were called for the purchase of petroleum and natural gas leases covering 34 of them. Twenty-four leases covering Alberta properties and nine leases covering Manitoba properties were issued, the total acreage leased being 6,754.61 acres. The mineral rights in one Ontario property were disposed of by quit claim letters patent.

The revenue derived from mineral rights in the provinces was \$54,726.15, made up as follows: bonus for purchase of petroleum and natural gas leases, \$47,801.50; rental, \$6,754.61; lease fees, \$165; one sale, \$5.

Ordnance, Admiralty and Public Lands

Ordnance and Admiralty lands consist of all lands mentioned in the Schedule of the Ordnance and Admiralty Lands Act (R.S.C. 1927, Chap. 115). They are divided in two classes—Class "I" and Class "II". Lands in Class "I" shall be retained by the Government of Canada for the defence of Canada, but may be leased or otherwise used as the

Governor in Council considers in the public interest. Lands in Class "II" may be sold, leased or otherwise used as the Governor in Council from time to time directs. The sale of such lands may be made by public auction, or by private contract at the appraisal value to the person in possession on the condition that the occupant has made certain improvements.

Public lands are all Crown lands which are not dealt with under some specific Act. These lands are administered under the Public Lands Grants Act, R.S.C. 1927, Chap. 114. Sale or lease may be authorized only by the Governor in Council except that where the value of the land does not exceed \$5,000, the Minister may authorize the lease at an annual rental of not less than 6 per cent of the value. The policy has been to sell Public lands by public auction, by tender or by private contract to the occupant at its appraised value.

Every effort has been made to place lands under the administration of the department on a revenue producing basis and in cases where they are no longer required for governmental purposes, sale has been arranged provided that the price offered was adequate.

Appraisals, investigations, and reports on 66 areas were completed. Fourteen surveys were required in Quebec and four in Ontario in order to determine the correct boundaries and re-establish lost monuments. A number of the resulting plans have since been registered.

Approximately 500 acres of land formerly controlled by the Indian Affairs Branch and the Department of National Defence and no longer needed for its original purpose has been transferred to the department and arrangements have been completed for its future use or disposal.

Seventy-seven subdivided lots and 37 parcels of various sizes have been sold for \$114,017.50, and 60 new leases have been negotiated with an annual revenue of \$7,875.49. All leases in connection with booming sites on the Fraser and Pitt Rivers are being reviewed and the rentals placed on an adequate basis. The present revenue from this source amounts to \$7,477.74 per year (which includes new leases) and is an increase over 1948 of approximately \$5,000.

The Central Office of Record which contains all records pertaining to lands under departmental control is constantly revising the registers as more information becomes available. Considerable research is required in this connection, particularly in the cases where the original title is clouded or where leases have been granted based on descriptions which were not related to permanent boundaries. By means of surveys this latter condition is being rectified and considerable progress has been made during the past year.

Public Lands

The department also administers Public lands which, originally acquired by other Government departments for some specific purpose, are no longer required. During the past year three such areas ranging in size from one-third of an acre to 320 acres were received. Two of these have been sold and negotiations are under way in connection with the third. In each case a considerable amount of research work has been required in connection with the title and legal description.

Letters Patent

During the fiscal year there were 53 Letters Patent issued covering a total of 1,307 acres, divided according to provinces and territories as follows:

	Patents	Acres
Alberta	2	211
Saskatchewan	7	1,033
Northwest Territories	19	9
Yukon Territory	25	54
Totals	53	1,307

The various kinds of grants are dealt with in the following table:

	[*] Homesteads		[*] Soldiers' Grants	
	Patents	Acres	Patents	Acres
Alberta	1	79	1	132
Saskatchewan	3	396	3	476
Northwest Territories ..	..	..	..	..
Yukon Territory .....	..	..	..	..
Totals	4	475	4	608

	[*] Pre-Sales		Sales	
	Patents	Acres	Patents	Acres
Alberta .....	..	..	..	..
Saskatchewan	1	161	..	..
Northwest Territories ..	..	..	19	9
Yukon Territory .....	..	..	25	54
Totals	1	161	44	63

^{*} Under this heading are included lands entered 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.

There were 140 certified copies of Letters Patent issued during the fiscal year for which the department received \$360.

Dominion Lands Records

The examination and segregation of files for disposal, in conformity with procedures approved by the Public Records Committee and the Treasury Board, is proceeding under the direction of experienced departmental officers. Files relating to patented and unpatented homesteads and other phases of land settlement in Manitoba have been transferred to the Department of Mines and Natural Resources at Winnipeg. Files which have no value have been destroyed. Files of historical value were made available to the Public Archives. Upon completion of the Manitoba files, Dominion Lands records regarding land settlement in Saskatchewan, Alberta, and the Railway Belt and the Peace River Block in British Columbia will be dealt with in the same manner.

Among the operations completed were: 2,041 cabinet drawers of files examined; 106 cartons, containing approximately 17,178 files and

weighing 6,000 pounds, were shipped to Manitoba; and approximately 203,200 files, representing the salvage of 10,160 pounds of paper, were destroyed. The foregoing has resulted in the emptying of 797 standard steel file cabinet drawers which have been made available for other sections of the Department.

Work continues in connection with the preparation of a land index and 27,229 letter-press copies of Dominion Lands Patents have been indexed according to land description.

Central Office of Record

Order in Council P.C. 258, dated February 12, 1934, provides that the office of the Lands Administration of the Department shall be the Central Office of Record for all lands owned or otherwise controlled by the Government of Canada, and that the several departments of the Federal Service shall furnish the Department with information essential to the maintenance of an adequate record of these properties.

This Central Office of Record now includes complete files and plans relating to all land, comprising 10,000 parcels, administered by this department. In addition, and notably in the case of the Department of Agriculture and the Department of Public Works, particulars have been supplied for over 7,000 parcels under the control of these departments. With the co-operation of Government departments, these records are gradually being improved to the end that a complete record will be available at all times in regard to property owned or controlled by the Government of Canada.

Timber and Grazing Within the Provinces

Timber

There are eight licence timber berths in British Columbia comprising a total area of 42.85 square miles within the boundaries of the national parks. The revenue obtained from these berths amounted to \$518.80.

There were no timber operations on Berth No. 5111 near Hosmer, British Columbia, the only other berth administered by the Department.

Grazing

There were six grazing permits issued on the animal quarantine reserves in southern Saskatchewan. The area covered by these permits comprised 10,400 acres and stock returns submitted by the permittees indicated that during the 1949 grazing season, 326 cattle and 62 horses were maintained on the land. The revenue derived from ground rental was \$157.

Seed Grain, Relief and Fodder Indebtedness

During the years of homesteading in Western Canada the Federal Government was frequently called on to assist the settlers by advancing seed grain, fodder, and relief. These advances were made in almost every

year from 1876 to 1926 and were secured by interest bearing charges against the borrower's land. From 1919-22 the Provincial Governments of Saskatchewan and Alberta gave a joint guarantee with the Federal Government on advances of relief and fodder.

Many accounts are still outstanding and settlements are being made by payment in full or at an adjusted amount after investigation and recommendations by one of the Seed Grain Adjustment Boards which have been established on the authority of an "Act Respecting Certain Debts Due the Crown", Section 1, Chapter 51, George V, 1927. During the fiscal year 1949-50 the Seed Grain Adjustment Boards made 347 recommendations to Council and as a result \$105,945.43 was written off and 1,491 liens removed from title. There were also 11 advances paid in full and the liens discharged. Cash payments in the net amount of \$54,216.01 were made by the property owners.

In addition to the settlements effected through the Seed Grain Branch, approximately 800 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, 12 certificates of indebtedness were issued registering 37 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, 1950:

	Principal	Interest	Total
	\$ cts.	\$ cts.	\$ cts.
<i>Debits</i>			
Balance outstanding March 31, 1949.....	2,089,133 18	3,461,084 54	5,550,217 72
Accrued interest April 1, 1949, to March 31, 1950.....		121,762 23	121,762 23
Total debits.....	2,089,133 18	3,582,846 77	5,671,979 95
<i>Credits</i>			
Net Revenue April 1, 1949, to March 31, 1950	38,940 28	15,275 73	54,216 01
Amount written off as loss by Orders in Council (Sec. 1, Chap. 51, 17 George V.)...	19,579 64	86,365 79	105,945 43
Total credits.....	58,519 92	101,641 52	160,161 44
Amount outstanding March 31, 1950.....	2,030,613 26	3,481,205 25	5,511,818 51

Province of British Columbia

	Principal	Interest	Total
	\$ cts.	\$ cts.	\$ cts.
Amount outstanding March 31, 1950.....	25 00	43 75	68 75

Province of Alberta

	Principal	Interest	Total
	\$ cts.	\$ cts.	\$ cts.
Debits			
Amount outstanding March 31, 1949.....	667,791 40	1,136,335 35	1,804,126 75
Accrued interest April 1, 1949, to March 31, 1950.....		38,960 15	38,960 15
Total debits.....	667,791 40	1,175,295 50	1,843,086 90
Credits			
Net revenue April 1, 1949, to March 31, 1950.....	13,667 81	2,334 11	16,001 92
Amount written off as loss by Orders in Council.....	10,927 95	37,216 68	48,144 63
Total credits.....	24,595 76	39,550 79	64,146 55
Amount outstanding March 31, 1950.....	643,195 64	1,135,744 71	1,778,940 35

Province of Saskatchewan

	Principal	Interest	Total
	\$ cts.	\$ cts.	\$ cts.
Debits			
Amount outstanding March 31, 1949.....	1,412,132 33	2,308,361 36	3,720,493 69
Accrued interest April 1, 1949, to March 31, 1950.....		82,324 36	82,324 36
Total debits.....	1,412,132 33	2,390,685 72	3,802,818 05
Credits			
Net revenue April 1, 1949, to March 31, 1950.....	24,704 49	12,775 80	37,480 29
Amount written off as loss by Orders in Council.....	8,568 54	48,362 17	56,930 71
Total credits.....	33,273 03	61,137 97	94,411 00
Amount outstanding March 31, 1950.....	1,378,859 30	2,329,547 75	3,708,407 05

Province of Manitoba

	Principal	Interest	Total
	\$ cts.	\$ cts.	\$ cts.
Debits			
Amount outstanding March 31, 1949.....	9,184 45	16,345 33	25,529 78
Accrued interest April 1, 1949, to March 31, 1950.....		476 47	476 47
Total debits.....	9,184 45	16,821 80	26,006 25
Credits			
Net revenue—April 1, 1949, to March 31, 1950.....	567 98	165 82	733 80
Amount written off as loss by Orders in Council.....	83 15	786 94	870 09
Total credits.....	651 13	952 76	1,603 89
Amount outstanding March 31, 1950.....	8,533 32	15,869 04	24,402 36

Northern Administrations**Administration**

Administration of the various acts, ordinances, and regulations pertaining to the Northwest Territories and the transaction of business arising from the general administration of Yukon Territory under the Yukon Act and Ordinances passed by the Territorial Council are the responsibilities of Northern Administrations of the Development Services Branch. To facilitate departmental work at Ottawa, there is a Chief of the Arctic Division and a Chief of the Yukon-Mackenzie River Division. While the administration of measures concerning Yukon Territory and Mackenzie River federal constituency is thus consolidated in one division, the legislative body of Yukon Territory is the Yukon Territorial Council at Dawson, and that of Mackenzie District is the Northwest Territories Council at Ottawa.

In the Mackenzie District, a District Administrator stationed at Fort Smith serves as Superintendent of Wood Buffalo Park, Agent of Dominion Lands, Crown Timber Agent, Mining Recorder, Stipendiary Magistrate, and Marriage Commissioner. The Sheriff of the Mackenzie Registration District is located at Fort Smith, and the Sheriff of the Yellowknife Registration District is located at Yellowknife. A District Administrator is stationed at Aklavik, where he has general administrative jurisdiction over the area lying north of the Arctic Circle, and acts as Agent of Dominion Lands, Crown Timber Agent, and Stipendiary Magistrate. An Agent who is also a Stipendiary Magistrate represents the Northwest Territories Administration at Yellowknife. 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 also 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.

In Yukon Territory the chief departmental official is the Commissioner of Yukon Territory, at Dawson. Officers at Whitehorse, Mayo, and Dawson act as Agents of Dominion Lands, Crown Timber Agents, and Mining Recorders. The department's forest engineer at Whitehorse supervises the forest protection service, and assists the Crown Timber and Land Agent in the administration of crown timber and public lands.

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 in 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 white persons, 4,334 Indians, 5,404 Eskimos, and 6 others, chiefly Asiatics. Recent population estimates give a total of 15,786, including

5,527 white persons, 4,334 Indians, 5,923 Eskimos, and 2 Asiatics. The increase in white population is accounted for by renewed mining activity and the institution of commercial fishing in Mackenzie District.

The Northwest Territories Act, 1905, with amendments, provides for a territorial government composed of a Commissioner, a Deputy Commissioner, and five members of council appointed by the Governor in Council. The Commissioner administers the government of the Territories under instructions from time to time given by the Governor in Council or the Minister of Resources and Development. The Commissioner 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, subject to any Act of the Parliament of Canada applying to the Territories respecting such matters as direct taxation within the Territories in order to raise revenue, establishment and tenure of territorial offices, maintenance of municipal institutions, licences, solemnization of marriage, property and civil rights, administration of justice, education, public health, and generally all matters of a local or private nature.

The Northwest Territories Council is presently constituted as follows:

Commissioner—Hugh L. Keenleyside

Deputy Commissioner—Roy A. Gibson

Members of Council—Stuart T. Wood

Harold B. Godwin

D. M. MacKay

John G. McNiven

Louis de la C. Audette

Secretary—James G. Wright

Work of Council

Nine regular and 27 special sessions of Council were held. The volume of legislative work was unusually great. A large number of ordinances were passed and many others were amended as changing conditions necessitated their revision or alteration.

Matters of policy were discussed in connection with provision of educational facilities, schools, and welfare teachers; medical, health, and hospital services, including tubercular X-ray surveys; control of epidemics; radio and radio-telephone facilities; development of transportation and costs of transportation; mining safety regulations; establishment of a mine rescue station at Yellowknife; control of arsenic fumes from mine roaster operations; administration of the liquor system; financial relationship of the Administration to the Yellowknife Administrative District; land tenure at Yellowknife; assistance to libraries; Eskimo Old Age pensions; the fostering of native handicrafts; scholarships; the fur trade; the wildlife service in the Northwest Territories; the caribou survey; commercial fishing; trader's permits; Eastern Arctic Patrol; and the organization of welfare work throughout the Northwest Territories.

Medical Officers

Medical officers of the Department of National Health and Welfare in the Northwest Territories represent the Department of Resources and Development in the administration of the public health and other relevant ordinances, and also in the matter of the health of non-Indian and non-

Eskimo residents. All doctors have been appointed coroners and medical health officers under the provisions of the Public Health Ordinance. Some of the doctors patrol outlying areas, and all make use of the Northwest Territories radio system of the Royal Canadian Corps of Signals in prescribing for patients who are unable to visit the settlements for medical treatment. The aeroplane is used in maintaining contact and in bringing sick to hospital for treatment.

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 1949, nine by missions of the Roman Catholic Church and the Church of England in Canada, one by a mining company at Port Radium, one by private enterprise at Norman Wells, and one by the local branch of the Canadian Red Cross Society at Yellowknife. 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 white persons 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 per person for their care and maintenance.

During the year, \$38,119.25 was expended for the care of destitute patients in the hospitals, while an average of 36.7 patients were accommodated in the industrial homes at a cost of \$13,656.04.

Indigent patients from the Northwest Territories received 8,379 days of treatment in institutions in the provinces at a cost of \$32,406.32. Of this total, 5,152 days of treatment were given to tuberculosis patients in the Charles Camsell Indian Hospital, Edmonton, Alberta, and 730 days of treatment in the Central Alberta Sanatorium. Treatment was given to insane persons in the Provincial Mental Hospital, Ponoka, Alberta, for 1,767 days.

Education

The education of white, Eskimo, and half-breed children residing in the Northwest Territories is the responsibility of the Northwest Territories Administration. A sub-committee on education advises the Northwest Territories Council on the program to be followed in the evolution of an educational system for the Territories, and on matters of educational policy.

Educational facilities in the Northwest Territories include Territorial day schools operated by the Northwest Territories Administration, day and residential schools conducted by the Church of England and Roman Catholic Missions, Indian day schools operated by the Indian Affairs Branch of the Department of Citizenship and Immigration and the school at Yellowknife operated by the Yellowknife School District.

During 1949, the Northwest Territories Administration operated Territorial day schools at Fort Smith, Port Radium, Port Brabant, Fort Simpson, Fort Resolution, Coral Harbour, and Lake Harbour. New

schools were erected at Aklavik and Fort Resolution, a building was remodelled for school purposes at Fort Simpson and later destroyed by fire, and a new school was partially constructed at Coppermine. The Discovery-Yellowknife Mine began the operation of a school at the mine, and received an assistance grant from the Northwest Territories Administration.

The only organized school district in the Northwest Territories is the Yellowknife School District. On March 31, 1950, the school had a total enrolment of 216 pupils in Grades 1 to 12 and a staff of eight teachers. During 1949, a grant of \$20,000 was made to the Yellowknife school by the Northwest Territories Administration.

As a means of achieving uniformity in the instructional program, and in order that the standing achieved by the pupils may be accepted by educational institutions throughout Canada, the schools in the Mackenzie District of the Northwest Territories follow the curriculum prescribed by the Alberta Department of Education. The program of education in the Mackenzie District is operated largely as a unit, and, for the purpose of raising instructional standards, all schools in the District are inspected periodically by the local Superintendent of Education who is stationed at Yellowknife.

All teachers employed in schools operated by the Northwest Territories Administration are Federal civil servants. Their salaries are determined on the basis of qualifications and experience, and they receive a northern living allowance in addition. Regular Civil Service Superannuation benefits have been established for them. A new classification of Welfare Teacher has been introduced, and teachers in this category are required to give special leadership in community activities, carry out welfare duties after school hours, and remain at the settlements for the twelve-month period.

The Northwest Territories Administration has instituted scholarship awards and tuition grants for the assistance of worthy students residing in the Territories. A School of Opportunity has been established at Yellowknife where promising students from every community of the Mackenzie District may pursue higher studies. Manual training equipment and supplies have been provided to a number of schools to assist them in initiating manual training instruction. Shipments of film are being made on a monthly basis to settlements in the Mackenzie District, and school broadcast programs, specially prepared by the Canadian Broadcasting Corporation for audiences of school children across Canada, have been re-broadcast over Mackenzie District radio stations. Correspondence courses were made available free of charge to all children residing in the Northwest Territories who requested them.

The Northwest Territories Administration is responsible for the education of all Eskimos in the Northwest Territories and also in northern Quebec. In 1949, a Territorial day school was erected at Coral Harbour on Southampton Island, and a school was established in conjunction with the Government nursing station at Lake Harbour on Baffin Island. A day school erected at Fort Chimo, Quebec, was opened in October, and another was established in temporary quarters at Port Harrison, Quebec. Arrangements were made for the maintenance and education of a number of Eskimo children in the Anglican and Roman Catholic residential schools at Fort George, Quebec.

Schools operated by the Church of England and Roman Catholic Missions included residential schools at Fort Resolution, Fort Providence, and Aklavik (two), and day schools in the principal settlements throughout 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. Grants totalling \$58,902.69 were paid for the maintenance of indigent children in the residential schools, and grants to mission day schools amounted to \$4,937.50. In addition, substantial quantities of supplies and equipment were provided to these schools.

Education of the Indian children in the Northwest Territories is the responsibility of the Indian Affairs Branch of the Department of Citizenship and Immigration. This Branch operated day schools at Fort Rae, Fort McPherson, Hay River, Fort Norman, and Rocher River, and had schools under construction at Arctic Red River, Fort Good Hope, and Fort Franklin. Many non-Indian children attended these schools from the settlements in which they were located, and educational costs were shared proportionately by the Northwest Territories Administration and the Indian Affairs Branch.

The total enrolment at all schools in the Northwest Territories during 1949 was 1,440 pupils. Of this total, 372 attended residential schools, and 1,068 attended day schools. In the Mackenzie District, the total enrolment at all schools as of March 31, 1950, was 1,081 pupils, as compared with 800 in 1947, and 948 in 1948.

Law and Order

Law and order were maintained throughout the Northwest Territories by the Royal Canadian Mounted Police. In addition, the police officers carried out many administrative functions at points where no departmental representatives were stationed, and assisted the wardens in forest and wildlife conservation work.

Liquor Permits

The liquor business in the Northwest Territories was operated as usual under the direction of the Northwest Territories Administration. The stores are located at Yellowknife and Fort Smith. Gross liquor sales increased slightly over the previous year. Two hotel beer parlours and a cocktail lounge at Yellowknife continued in operation. The privilege of beer sales by the Canadian Legion at Yellowknife was extended to include a women's beverage room.

During the fiscal year, 3,809 Class "A" annual permits and 38 Class "E" banquet permits were issued in the Northwest Territories. Seven Class "B" permits covering sacramental wine and 55 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 12,550 gallons of spirits, 1,612 gallons of wine, 7,510 gallons of ale and stout and 73,127 gallons of beer. Importation permits covered 110 gallons of spirits, 244 gallons of wine, and 120 barrels of beer.

Forest Protection

Twenty-seven forest fires were reported in the Northwest Territories during the 1949 season, a reduction of 58.5 per cent from the 65 fires recorded in 1948. The amount of merchantable timber burned also showed

a marked decrease, with 5,800 cords destroyed in 1949 as compared with 19,135 cords in 1948. Favourable weather conditions, increased efficiency in the forest protection staff, and the employment of systematic fire detection methods were all contributory factors in the reduction of fire losses.

Nine of the 27 fires reported were attributed to lightning, eight were caused by camp-fires, and the remainder had their origins in a variety of causes, some unknown. The weather throughout the season was distinctly favourable, with more than half the reported fires occurring in July when thunderstorms were most frequent. Only three fires were reported in September, which was the driest month.

A fire suppression crew was stationed at Fort Smith throughout the fire season. The crew members were well trained in fire-fighting techniques and performed valuable work as the nucleus of local crews and frequently as the total fire crew. Between fires, they were employed on road and building work around Fort Smith.

An adequate supply of fire-fighting equipment was kept at Fort Smith and a smaller cache was located at Yellowknife. Single fire-fighting units and tool caches were maintained at strategic points under the care of the Royal Canadian Mounted Police, and wardens in the various districts were provided with sufficient equipment to carry out normal fire suppression work.

All marine craft of the forest protection service were in constant operation, and the warden staff also carried out patrols by aircraft, canoe, truck, passenger car, and on foot.

The fire prevention publicity campaign was actively continued throughout the year. Every opportunity was taken to impress upon the native population, particularly the trappers and hunters, the necessity for exercising care in the selection of camp-fire sites. The co-operation of the armed services, police, private industry, and commercial air, land, and water transportation companies was solicited. The general public was kept aware of the danger from fire by repeated warnings in the newspapers and over the commercial radio stations. Forest fire prevention signs have been placed in prominent locations along roads and trails, at the beginning and end of portages, and in camping grounds along the common routes of travel.

The value of fire prevention education in the schools is fully appreciated. Literature stressing the need for care in dealing with fire is being made available to the children, and instructions on fire prevention are given in conjunction with lectures on natural science and social studies. When arrangements can be made, the fire wardens give lectures to the children in their districts. In this way, it is hoped to inculcate in each child such a regard for land, forests, and wildlife, that caring for them will become second nature.

Wood Buffalo National Park

During the summer of 1949, Wood Buffalo National Park received 24 elk from Elk Island National Park and 56 beaver from Prince Albert National Park. In addition, three beaver were transferred from Little Buffalo River to Seven Mile Lake.

Ninety-three buffalo were killed to supply fresh meat for distribution to needy Indians and to hospitals caring for Indians and half-breeds. The hides were sold by tender.

Maintenance work was carried out on the existing network of roads in the park, and more than 40 miles of new road were built from a point on the Bell Rock-Little Buffalo River road to within four miles of Pine Lake.

Reindeer

In March, 1935, a herd of 2,730 reindeer from Alaska was delivered to the selected Canadian range on the east side of the Mackenzie Delta. These animals were the foundation stock of an experimental project to train young natives in reindeer herding as an industry which will provide food and clothing suitable to the Arctic climate, and which would also tend to conserve the game resources. The reindeer have increased considerably in numbers and are now divided into three herds estimated to contain nearly 7,000 animals. Large quantities of meat and skins have been used for native welfare, including meat provided during an emergency in the winter of 1949-50 when illness struck the natives of the Mackenzie Delta and nearby areas.

At the roundup of the main herd in July, 1949, there were 4,317 reindeer. A further 1,468 head were reported to be in the Anderson River herd. No roundup was held of the herd under native management near the Eskimo Lakes. In February, 1950, the Anderson River herd was placed under native management as Native Herd No. 2 and moved to a new location near Port Brabant (Tuktuk). The reindeer herders are mostly Eskimos assisted by three Laplanders.

About 360 reindeer from the Government herds were slaughtered for meat during the fiscal year. The usual 100 carcasses were donated to the missions operating hospitals and residential schools at Aklavik. The remaining meat was utilized for camp use, relief, or sale. The revenue from reindeer products amounted to \$1,181.65. One hundred and eighty skins were shipped to the Eastern Arctic.

Yellowknife Administrative District

The local Trustee Board of Yellowknife now has eight members, five elected locally, and three appointed by the Commissioner of the Northwest Territories. The chairman is elected by the board from among its members. The board held 34 meetings and passed several by-laws covering such matters as motor liveries, assessment, taxation, poll tax, and traffic.

Hay River Administrative District

The Local Administrative District of Hay River was established by an ordinance of the Northwest Territories Council assented to on April 21, 1949, and the first election for members of the Local Trustee Board was held on June 1. The board consists of two members elected locally, and three members, including the chairman, appointed by the Commissioner of the Northwest Territories. Twenty-four meetings of the Board were held, and a number of by-laws were passed dealing with such subjects as motor vehicles, motor liveries, garbage disposal, and firearms.

Public Improvements

Buildings

The department made arrangements with the Department of Public Works to construct a number of buildings in the Mackenzie District, some of which were begun in 1948. At Fort Smith, an apartment building, the

District Administrator's house, and a Royal Canadian Mounted Police building were completed. A start was made on the construction of 10 buildings for a Welfare Institution at this settlement and they are expected to be ready for occupation in 1950. Three additional small residences for staff members were erected at Yellowknife, and four buildings for the department's representatives were built at Hay River Settlement. A house for a game warden was built at Fort Good Hope and materials were shipped for a similar house to be erected at Fort McPherson in 1950. At Aklavik, the administration-apartment building was completed and is occupied. A two-classroom public day school was erected at Aklavik and made available for use during the year. A standard two-classroom public day school with teacherage was built at Fort Resolution and the construction of a similar building was commenced at Coppermine. This latter building is partially ready for occupation, and will be completed in 1950. Buildings were purchased and employed as a public day school and teacher's living quarters at Fort Simpson. Subsequent to its purchase, the Fort Simpson school building was destroyed by fire, and use is being made of temporary quarters for the present.

Municipal Facilities

The water and sewage systems for the new section of Yellowknife Settlement, which were begun in 1947 and placed in operation in December, 1948, were completely installed by October, 1949. This utility was operated by the Department of Public Works until March 31, 1950, when the Northwest Territories Administration assumed the responsibility. Preparations for the installation of an all-year pure water supply system for Fort Smith and a summer system for Aklavik were made during 1949, and both systems should be in operation in 1950.

Investigations were carried out by the Northwest Territories Power Commission in preparation for the establishment of an electric power plant at Fort Smith. Construction of a building to house the plant was completed, and it is expected that the system will be installed by the end of 1950.

Roads

Maintenance work was continued on the Mackenzie Highway from the Northwest Territories border to Hay River Settlement. The winter truck road from Hay River to Yellowknife, which was begun in 1948, was improved during 1949. Maintenance work was carried out on roads in the settlements throughout the Mackenzie District, and on access roads to airports at Fort Smith, Fort Resolution, Yellowknife, and Fort Simpson. A grant of \$42,000 was made to the Local Administrative District of Yellowknife for road construction in the district.

Other Government Departments

The Department of Transport continued the maintenance of marine aids to navigation along parts of the Mackenzie River waterway, Great Slave Lake, Great Bear River, and Great Bear Lake. In 1949, a new range of lights was established at Hay River to mark the West Channel, primarily for fishermen. A system of buoys was also installed to mark the Kittigazuit channel at the Mackenzie Delta. The aids presently maintained are: Great Slave Lake, 17 lights, 5 pairs of range lights, and 5 lighted buoys; Great Bear Lake, 6 lights and 1 pair of range lights. In addition,

unlighted buoys and markers suitable to available depths are maintained. Details of the lighted aids provided by the Department of Transport may be found in *Lights and Fog Signals on the Inland Waters of Canada, 1950*.

Airfields

The Civil Aviation Division, Department of Transport, built living quarters for some of its employees at Yellowknife, Fort Smith, and Hay River, and made a number of electrical installations at various stations. A small maintenance crew has been stationed at Fort Simpson. Investigations were made in preparation for the improvement and extension in 1950 of an air strip at Pine Point on the south shore of Great Slave Lake, to facilitate the development of a base metal mining industry in this area.

Radio

The Radio Division, Department of Transport, operated all its existing stations during 1949. A new power-house was installed at Fort Chimo to supply the Ionospheric Station, a nursing station operated by the Department of National Health and Welfare, and a school operated by the Northwest Territories Administration. The Resolution Island marine station was destroyed by fire early in 1949 and replaced during the summer.

Meteorological Service

Thirty-eight meteorological stations were maintained in the Northwest Territories by the Meteorological Division of the Department of Transport. Thirty-two are telegraph reporting stations and the remaining six are climatological stations which report by mail only. The Radio Division of the Department of Transport, the Royal Canadian Corps of Signals, and the Government Telegraph Service helped to maintain radio communication with these weather stations. The Hudson's Bay Company co-operated by observing and recording meteorological information, and communicating it via their own system.

Commercial Fishing

Great Slave Lake, the fifth largest lake on the continent, has become one of the world's greatest inland commercial fishing areas. Since the opening of the lake to commercial fishing in 1945, the program of fishery management has permitted an increase in the catch limits of whitefish and trout from 2,000,000 pounds per year to 9,000,000 pounds. The new Mackenzie Highway from Hay River to Grimshaw, Alberta, has been an important factor in the success of commercial fishing operations.

Summer fishing began on Great Slave Lake on June 17, and the season closed on September 15. The quota of whitefish and trout was 5,000,000 pounds, and approximately 4,650,000 pounds were taken by the six companies engaged in the industry. Sixty-six fishing boats were used and 212 fishing licences were issued. For the first time since commercial fishing began in 1945, a Federal Department of Fisheries patrol boat and three patrol canoes operated on Great Slave Lake.

During the winter fishing 611 licences were in effect, with the season opening on December 1, 1949, and closing on March 18, 1950. In Areas 1 and 2, ten companies were engaged in commercial operations and took 3,722,783 pounds of the 4,000,000-pound quota set for whitefish and trout. Area 3 made up the remainder of the quota.

The development of the Great Slave Lake fishery has contributed greatly to the growth of Hay River Settlement, and provided employment for the native residents.

Lake Claire in Wood Buffalo Park was once again the scene of a commercial fishery engaged in taking goldeye. The season lasted from June 1 to July 31 inclusive, and a catch quota of 250,000 pounds was set. With 13 boats in use, 117,000 pounds of fish were taken.

A new commercial fishery was begun during the winter of 1949-50 in the Northwest Territories portion of Nueltin Lake which straddles the Manitoba border. The season extended from December 1, 1949, to March 31, 1950, and a catch limit for whitefish and trout was set at 250,000 pounds. Operations began only after it was assured that Eskimos residing in the area would receive employment.

A reduction and processing plant at Churchill, Manitoba, was permitted to take belugas during the summer of 1949 in the waters of Hudson Bay, and 215 animals were taken. The industry was strictly controlled by the Department of Fisheries, and regulations to prevent the killing of belugas by sportsmen were enforced.

Agriculture

In 1949, the Dominion Experimental Substation at Fort Simpson enjoyed the best harvest in its short history. An early spring and fine autumn weather, with the first killing frost about two weeks later than usual, contributed greatly to the success achieved in spite of below-average precipitation from April until mid-August. Potatoes, carrots, beets, corn, cucumbers, squash, marrow, and tomatoes all produced excellent results. In forage crops, most of the standard varieties of the commonly grown species have shown promise.

The plot under cultivation at Yellowknife produced good forage crops, and fair results were achieved with wheat, oats, and barley, although they did not fully ripen. Vegetable variety and fertilizer trials yielded very useful information which was passed on to local gardeners. Interest in gardening is increasing every year, and most home owners in Yellowknife are trying to beautify their grounds.

Co-operative trials were carried out at points throughout the Mackenzie District from Fort Smith to Aklavik, and it has been demonstrated that gardening is feasible at all settlements down the Mackenzie River. In August, the officer in charge of the Fort Simpson substation visited all gardeners engaged in co-operative trials.

Scientific Surveys

During 1949, the Water Resources Division maintained stream-gauging stations on six rivers flowing from the north into Great Slave Lake, and periodic visits to all stations were made by means of air transportation. A study of the discharge conditions of the overflow channel and of the spillway dam at the Snare River power project was made, and a detailed report was prepared for the Northwest Territories Power Commission.

The Mines Branch of the Department of Mines and Technical Surveys continued to aid in the development of the mineral resources of the Northwest Territories. Research was carried on and technical assistance given to the Eldorado Mining and Refining (1944) Limited, on methods of treating uranium ore, and technical aid was given to privately owned

uranium prospects. Tests were conducted on the treatment of gold ores from the Discovery-Yellowknife mine and progress was made in solving problems relating to complex gold ores of the Yellowknife district. The Fuels Research Laboratories analyzed 24 samples of coal from the Great Bear Lake area and one sample of black lignite from the Darnley Bay area on the Arctic Coast.

The Geological Survey of Canada had eight parties conducting geological mapping in the Northwest Territories during 1949. Parties were active in the Aylmer Lake, Carp Lakes, Great Slave Lake (East Arm), Walmsley Lake, Yellowknife Bay, Matthews Lake, Giauque Lake, Ghost Lake, and Baffin Island areas. An officer of the Geological Survey made an inspection trip to the Mackenzie District to acquire information on the trend of the mineral industry.

Five parties from the Geographical Branch worked in the Northwest Territories during the 1949 field season. Four parties worked in the Eastern and Western Arctic, while the fifth conducted a survey of the possibilities for scientific geographical work in the Mackenzie Valley. One of the Arctic parties accompanied the Magnetic Survey on its annual Arctic expedition, while another accompanied the joint United States-Canada Weather Station Resupply Mission.

The Division of Terrestrial Magnetism of the Dominion Observatory in co-operation with the Royal Canadian Air Force carried out an airborne magnetic survey of the central part of the Canadian Arctic Archipelago and of the mainland areas to the south. In co-operation with the Royal Canadian Navy, the division also carried out a magnetic survey to southern and western Baffin Island. The magnetic observatory established at Resolute Bay, Cornwallis Island, in the summer of 1948 continued to function, and, in the spring of 1949, a prefabricated non-magnetic building was erected as an observatory at Baker Lake.

Legal Surveys completed 193 miles of township outline control surveys in the Mackenzie District in 1949. Lot and subdivision surveys were carried out at many of the settlements and a survey of the Snare River power development and its transmission lines was completed.

The Geodetic Survey conducted precise levelling 82.5 miles along the Mackenzie Highway in the Northwest Territories. Exploratory astronomical control work was continued at 90 stations in the Northwest Territories. During the winter, a party established six monuments in latitude 60 degrees north, between the Little Buffalo River and the Mackenzie Highway, to control the delimiting of the Alberta-Northwest Territories boundary in that section.

The Topographical Survey and the Army Surveys Establishment established horizontal control for 13 map sheets on a scale of 1 inch to 1 mile on the south side of Great Slave Lake, and horizontal and vertical control for 11 map sheets on the same scale at the east end of Great Slave Lake. Detailed mapping on the scale of 1 inch to 1,000 feet was carried out in the Indian Mountain Lake area.

The Hydrographic Service conducted exploratory surveys at the east end of Baker Lake, and efforts to find a safe deepwater channel met with some success. Charting of Great Slave Lake was continued, and the season's work resulted in the completion of a 95-mile stretch along the northwest shore. A number of good harbours of refuge and sheltered anchorages were located and charted for the security in stormy weather of the shallow draught shipping on the Fort Norman-Yellowknife

run. An important feature in last year's operations was the location and development of a new and hitherto unknown deep channel into the lake through the Slave River delta, a development which obviated the necessity for an expensive dredging project.

The Map Compilation and Reproduction Division issued revisions of seven National Topographic Series sheets on the scale of 1 inch to 8 miles, revisions of four maps of the Great Slave Lake area on the scale of 1 inch to 4 miles, one new World Aeronautical chart at 1:1,000,000, a map of the underwater contours of the east arm of Great Slave Lake, a revision of the magnetic map of the Northwest Territories and Yukon Territory, and the northern extension of the 64-mile map of Canada.

Yukon Territory

Yukon Territory comprises the extreme northwestern part of the mainland of Canada. With an area of 207,076 square miles, or approximately half that of Ontario, it extends from the Arctic Ocean on the north to British Columbia and Alaska on the south, and from Mackenzie District of the Northwest Territories on the east to Alaska on the west.

Most of the Yukon's population is found in the southern part of the Territory, chiefly concentrated around the three major settlements of Whitehorse, Mayo, and Dawson. According to the 1941 census, the total population of the Territory was 4,914, but new developments, including a revival of the mining industry, have increased this figure. The estimated population in 1949 was 8,641, composed of 7,141 white persons, 1,447 Indians, and 53 Eskimos.

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 Resources and Development. The Commissioner in Council is empowered to make ordinances pertaining to the imposition of local taxes, establishment of territorial offices, maintenance of prisons and municipal institutions, property and civil rights, solemnization of marriage, administration of justice, incorporation of companies, issue of licences, preservation of game, sale of liquor, and generally all matters of a local or private nature in the Territory. The seat of government is at Dawson, Yukon Territory.

Territorial Council

The Commissioner of the Yukon Territory is J. E. Gibben, K.C., Dawson. The Yukon Territorial Council was dissolved in April, 1949, and an election was held on July 25, when the following members were elected for a three-year term: Mayo District, Ernest J. Corp, Keno Hill; Whitehorse District, R. Gordon Lee, Whitehorse; and Dawson District, Charles J. Lelievre, Dawson.

Work of Council

Renewed activity in Yukon Territory has created a need for a great amount of increasingly complex legislation designed to keep pace with new social and economic conditions. The financial agreement with the Federal Government, which was signed in 1948, has necessitated a considerable

amount of readjustment in legislation concerning local taxation. As a result, two sessions of the Yukon Territorial Council were held in 1949.

The Council met on March 30, and was dissolved on April 8. At this session, the following new ordinances were passed: Gasoline and Diesel Oil Tax; Old Age and Blind Pensions; Supplementary Supply; Societies; and Supply Ordinances. At the same session, the following ordinances were amended: Yukon Territorial Council; Government Liquor; Sale of Beer; Hospitals; Public Administrator's; Motor Carriers; Motor Vehicles; Yukon Game; and Yukon Territorial Public Service Ordinances.

The new council, which was elected on July 25, convened on October 5 and was prorogued on October 25. A large amount of legislation was considered, and the following new ordinances were passed: Assignment of Book Debts; Bulk Sales; Gasoline and Diesel Oil Tax (replacing the Ordinance passed at the earlier session); Burial Sites; Forest Protection; Whitehorse City Charter; Municipal: Whitehorse Plebiscite; Cancellation of Certain Assessments; Noise; an Ordinance to Exempt Mayo Light Plant from Payment of Licence Fee; and Supplementary Supply Ordinances. Amendments were also made to the Yukon Corporation Income Tax, Companies, Sale of Beer, Government Liquor, Motor Vehicle, Fur Export Tax, Yukon Game, Yukon Health, Poll Tax, Fire Prevention, Dental, and Hospitals Ordinances.

Territorial Administration

Appointments to the Territorial staff during 1949 included B. G. Harvey as Superintendent of Works and Buildings, and Them Kjar as Director of Game and Publicity, a newly created position. Mr. Kjar's headquarters were established at Whitehorse, where his duties included promotion of the tourist industry and enforcement of game conservation measures.

Revenue collected under Territorial Government ordinances was \$202,837.65. The amount transferred from the liquor account was \$450,415.21. A grant of \$211,400 was made to the Yukon Council by the Federal Government in accordance with the provisions of the financial agreement concluded in 1948, and \$22,281.39 was drawn from the surplus account, making a total revenue of \$886,934.25.

Municipal Expansion and General Construction

The incorporation of Whitehorse as a city has been under discussion and a Territorial Ordinance passed during the year provides a city charter to be used if the residents of Whitehorse vote in favour of incorporating the settlement.

The Territorial Government spent \$204,546.32 on roads, bridges, public works, and equipment, the greater part of this sum being used for the maintenance and construction of mining roads. Capital expenditures on buildings and equipment totalled \$164,439.41.

Health and Welfare

A total of \$210,964.42 was spent on hospitals, charities, and public welfare. Included in the total were: care of indigents, mostly aged persons, \$45,235.56; child welfare, \$16,490.55; and grants to hospitals, \$109,138.10.

The tubercular X-ray survey which was begun in 1948 was continued in 1949 in conjunction with the Department of National Health and Welfare. There were 1,885 plates taken at a cost of \$2,064.20 to the Territorial Government. Assistance in transporting the survey party was received from the Royal Canadian Air Force.

Health officers were stationed at Dawson, Mayo, and Whitehorse, where they carried out the duties defined in the Public Health Ordinance of 1948. At a cost of \$2,100 they gave medical care to persons in receipt of assistance from the Territorial Government. Detection and control of venereal disease was also the responsibility of these officers.

Registrations under the Vital Statistics Ordinance were: births, 286; marriages, 65; and deaths, 73.

Education

Expenditures on education by the Territorial Government were \$137,663.93, an increase of \$22,805.73 over the previous year. There were 652 pupils enrolled in the Territory's ten schools, and daily attendance averaged 503.57. Twenty-three teachers were employed, most of them holders of first-class British Columbia or Alberta certificates.

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.

Fur and Game

Revenue collected under the Fur Export Tax was \$10,572.23. Bounty payments for wolves and coyotes amounted to \$4,050, a decrease of \$6,270 from the previous year.

The numbers of bear, beaver, mink, otter, wolverine, wolf, and squirrel pelts taken showed increases over the previous year.

Territorial Expenditure

Administration expenses of the Territorial Government amounted to \$169,320.16 which, together with the expenditures on public works, education, and health and welfare, made a total expenditure of \$886,934.24 for the fiscal year ended March 31, 1950.

Law and Order

Law and order have been well maintained throughout the Territory by the Royal Canadian Mounted Police.

Federal Administration

The Development Services Branch of the Department at Ottawa, formerly the Lands and Development Services Branch of the Department of Mines and Resources, is responsible for the transaction of business arising from the general administration of the Territory under the Yukon Act and Ordinances passed by the Yukon Territorial Council. The natural resources of the Territory are also administered by this Branch.

Forest Protection

An increasingly efficient forest protection service and favourable weather conditions combined to effect a substantial reduction in forest fire losses in the Yukon during 1949, as compared with the previous year. Statistics for the past two years are as follows:

	1948	1949
Number of fires reported:	15	10
Total area burned (acres):	55,820	152
Total merchantable timber burned (acres):	50,911	120

Costs incurred for actual fire-fighting during 1949 amounted to \$975, which compares most favourably with the figure for 1948, when the sum of \$14,509 was expended. However, the comparatively high figure for 1948 was directly attributable to two major outbreaks which alone accounted for 93 per cent of the fire-fighting costs for that year. Capital expenditures in 1949 on fire-fighting equipment, maintenance, and other pre-suppression costs amounted to approximately \$25,000, as compared to \$21,000 in 1948.

Of the 10 fires reported during 1949, eight were caused by carelessness on the part of smokers and campers, one fire resulted from industrial operations, and one was of unknown origin. It is evident that most of the fires originate along the more commonly travelled routes and around the centres of population, and forest protection is therefore primarily confined to accessible timber areas adjacent to the settlement and to the land and water travel routes.

As in past years, the Department of National Defence (Army and Air Force), and all privately owned land, air, and water transportation companies, and the Northwest Communication System, were requested to report all fires observed. Similar appeals were made to the native population, prospectors, and others who frequent forested areas, and a gratifying response was received from all concerned. Fire observation flights, made possible by the Royal Canadian Air Force, were also of assistance.

The fire prevention publicity campaign was continued. Forest fire protection signs were erected along the Alaska Highway and secondary roads. Signs were also posted along trails, at service stations, campgrounds, lunch stops, and in all places where they would attract the attention of the travelling public. The forest protection film *Tomorrow's Timber* was shown at all Northwest Communication System repeater stations, Northwest Highway System maintenance camps, and Royal Canadian Air Force stations along the Alaska Highway and the Northwest Staging Route in Yukon Territory. It was also shown in the Whitehorse schools, and accompanied the tuberculosis survey party to be shown with other educational films at outlying settlements. A Junior Forest Warden organization was started at Whitehorse and promises to create welcome interest in fire prevention and suppression work.

Natural Resources Development

Construction of roads to stimulate development of the Territory's natural resources constituted a major part of the Department's activity in the Yukon during the past year. The centre section of the Whitehorse-Mayo-Dawson trail, from Carmacks to Mayo via Minto, was converted into an all-weather road, and construction work was completed with the

exception of a 12-mile section near Mayo. In all, 130 miles of road have been built through exceedingly rough country. In addition to the \$400,000. spent in 1948, the sum of \$1,858,901.70 was expended in 1949 on construction of the Carmacks-Mayo section and in laying in supplies and equipment for construction of the 108-mile Whitehorse-Carmacks section in 1950. Present plans call for completion of the road from Whitehorse to Mayo by the end of 1950, giving the silver-lead mining district of Mayo access to the Alaska Highway and railhead at Whitehorse.

Another important link in the transportation system is the 58-mile all-weather road which was constructed in 1949 from Atlin, British Columbia, to the Alaska Highway at Mile 867, Jake's Corner, Yukon Territory. The new road lies partly in British Columbia and partly in Yukon Territory, and funds for its construction were provided jointly by the British Columbia and Federal Governments, the British Columbia Government contributing \$200,000 and the Federal Government \$250,000. It is expected that the road will be of mutual benefit to the Yukon Territory and to Atlin itself, which is the centre of an important gold mining district.

The Tantalus Butte coal mine near Carmacks, which was developed with financial assistance from the Federal Government, continued to operate during 1949. The market for fuel from this mine is steadily expanding, and 2,553 tons of coal were sold during the year, as compared with 1,525 tons in 1948, and 250 tons in 1947. The department offered its support in the search for new markets, and it is expected that sales in Whitehorse will increase considerably when the Whitehorse-Carmacks section of the Whitehorse-Mayo-Dawson Road is completed in 1950. At the peak of operations in July, the mine employed 14 white persons and 16 Indians.

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 Northwest Highway System (Canadian Army). The highway was open for traffic throughout the year. Maintenance work included grading, gravelling, relocation, culvert and sign installation, and bridge repair and replacement. Similar repair and maintenance work was carried out on the Haines Road, which was open for traffic during the summer months only.

Facilities for tourist accommodation and for the maintenance and repair of motor vehicles continued to increase in number. An inspection of sanitary conditions in roadside establishments was carried out by a sanitary engineer of the Department of National Health and Welfare, and periodic inspections were made by the Yukon Territorial sanitary inspector. These measures are aimed at protecting the health of tourists by ensuring that roadside facilities are kept at a high standard.

The Development Services Branch, with the help of the Northwest Highway System (Canadian Army), maintained its 10 public overnight camp-grounds and five lunch stops in good condition, and tourists frequently expressed their appreciation of these facilities.

Regular bus services were operated on the highway between Dawson Creek and Dry Creek by the British Yukon Navigation Company, and from Dry Creek to Fairbanks and Anchorage, Alaska, by Alaska Coachways.

The Royal Canadian Air Force continued to maintain the airports along the Northwest Staging Route, 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. Facilities for public long-distance telephone and commercial telegraph services are provided at a number of repeater stations along the highway. In addition, this system offers connections with other Department of Transport wireless communication facilities at Fort St. John, Beatton River, Fort Nelson, Smith River, Watson Lake, Teslin, Whitehorse, Aishihik, and Snag, and with commercial telegraph and telephone services in the remainder of Canada and in the United States and Alaska.

Hydro-electric Developments

The Yukon Electrical Company, Limited, which supplies Whitehorse and vicinity with light and power, proceeded with the construction of a 400-horsepower hydro-electric development on Porter Creek, about seven miles west of Whitehorse. The plant was brought into operation in November, 1949, but was forced to close down in January, 1950, owing to technical difficulties. The plans for the project will be revised when the weather allows proper investigation, and it is expected that the plant will again be in operation by late autumn, 1950. An engineer of the Water Resources Division acted as inspecting engineer for this development, in accordance with the Dominion Water Power Regulations.

The Water Resources Division has a sub-office at Whitehorse, and maintained five stream-gauging stations in Yukon Territory in 1949. Special attention was given to determining the flow of the Mayo River, where the department also conducted a survey of potential hydro-electric power resources and investigated the possibility of developing power to supply the Mayo silver-lead mining area.

Mining

The mining industry once again enjoyed a successful year, with noteworthy increases reported in production of gold, silver, lead, zinc, and coal. Preliminary figures for 1949 mineral production are: gold, mostly placer, 81,970 fine ounces; silver, 1,559,000 ounces; lead, 5,300,000 pounds; zinc, 1,000,000 pounds; and coal, 2,553 tons.

Scientific Surveys

A survey party from the British Columbia Department of Lands located and monumented approximately 45 miles of the British Columbia-Yukon boundary, between 126 degrees and 128 degrees west longitude. Permanent monuments were erected at intervisible points not more than three miles apart, and the boundary line was well blazed.

Five parties from the Geological Survey of Canada were active in Yukon Territory during the 1949 field season. Geological studies and mapping were carried out in the McQuesten, Glenlyon, Dezadeash, Galena Hill-Keno Hill, and Whitehorse areas. The Geographical Branch sent two geographers to the Yukon in 1949 to conduct land use and settlement studies along the Alaska Highway. The Geodetic Survey continued triangulation eastward in the plateau area west of Watson Lake,

astride the Alaska Highway. The Topographical Survey and the Army Surveys Establishment carried out horizontal and vertical control work for nine map sheets on the scale of one inch to four miles. In addition, networks of continuous triangulation control were carried from Dawson eastward through Mayo to Swan Lake, from the Alaska Highway eastward along the Canol Road to Sheldon Lake, and from Watson Lake northward to Sheldon Lake. Legal Surveys surveyed the road from the Alaska Highway to Whitehorse Rapids, and the Two Mile Hill Road from Whitehorse to the Alaska Highway. Miscellaneous lot surveys were carried out at Whitehorse, Haines Junction, Burwash Landing, Marsh Lake, and at various points along the Territorial roads and the Alaska Highway, including the Dominion Experimental Substation at Mile 1019. In addition, 91 mineral claims at Mayo were surveyed. The Royal Canadian Air Force continued its program of aerial photography to assist in mapping the Territory.

Agriculture

In 1949, the Dominion Experimental Substation on the Alaska Highway, 100 miles west of Whitehorse, continued to expand its activities both on and off the station. Although the earliest spring in the substation's history was experienced, the growing season was extremely dry. Late seasonal rains stimulated biological activity and much immature second growth was evident in all cereal crops. Fair yields and samples were nevertheless secured from most threshed areas. Off-station activities were conducted at Mayo, Fort Selkirk, Lake Tagish, Takhinni, and Mile 970. Experiments with cereal varieties and forage crops have produced encouraging results at all these points. Forage crops sown in the test plots at Mayo and Fort Selkirk in previous years have survived the winters in perfect condition.

The cattle which were introduced on the substation in 1948 have proved quite adaptable. Poultry have done reasonably well, and chicks secured in May came into production in October. Two winter seasons have shown that the poultry houses in use are well suited to weather conditions in Yukon Territory.

Eastern Arctic Patrol

The loss of the R.M.S. *Nascopie* in 1947, plus the growth in the activities of Government and other organizations interested in the north, has resulted in a radical change in the organization of the Eastern Arctic Patrol in recent years. While supplies are carried to the Eastern Arctic posts by a number of smaller vessels, increasing reliance is being placed on air transport for administrative and medical inspections and to meet emergencies such as epidemics or shortage of food amongst the natives.

During the summer of 1949 Eastern Arctic posts were supplied by the new Hudson's Bay Company vessel the *Rupertsland*; the *Earle Trader*, *Terra Nova*, *Fort Severn*, and *Newfoundlander*, also operated by the Hudson's Bay Company, the *Regina Polaris* operated by the Hudson's Bay Vicariate Transport Limited, the *Ice Hunter* operated by the Baffin Trading Company, and the Canadian Government icebreaker, the *N. B. McLean*.

In April 1949 an inspection flight carrying S. J. Bailey, administrative officer of the Northwest Territories Administration, Dr. R. N. Simpson, Medical Superintendent for the Eastern Arctic, Indian Health Services, Department of National Health and Welfare, a representative of the National Film Board, and an artist illustrator, visited posts on the west side of Hudson Bay and inland, including Repulse Bay, Pelly Bay, and Igloolik, and Arctic Bay, Pond Inlet, and other points in Baffin Island.

A similar flight covered points on the east side of Hudson Bay during August. Members of this patrol included S. J. Bailey of the Northwest Territories Administration, Dr. R. N. Simpson of Indian Health Services, and a dentist. During March, 1950, Mr. Bailey and Dr. Simpson visited Chesterfield by air in connection with arrangements for rehabilitating the victims of a poliomyelitis epidemic. Mr. Bailey also made an inspection by air of posts in the central Arctic, i.e., the Coppermine-Cambridge Bay-Spence Bay area.

J. W. Burton served as Senior Canadian Observer on the U.S. Resupply Mission to the joint Canadian-United States weather stations in the high Arctic. The 10 Canadian observers on this mission secured much useful scientific and other information on the northern sector of the Canadian Arctic Archipelago.

At all points 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 Department of Citizenship and Immigration.

Aside from the poliomyelitis epidemic at Chesterfield and an influenza epidemic in the central Arctic, health conditions among the Eskimo were good. Wildlife resources of the land and sea have been adequate except in certain areas such as the coast of northern Quebec, although a rather poor fur year and the depressed prices in the fur trade have raised serious problems for the Eskimos who are finding it extremely difficult to pay for equipment and other items of trade which they require. Hence, the state of the Eskimo economy presents a serious problem which is receiving intensive study in an effort to discover new and improved sources of income. One method of supplementing the income of the Eskimo lies in the development of handicrafts, and during the year an agreement was reached with the Canadian Handicrafts Guild whereby the Guild, assisted by a grant from the Administration, undertook to organize and encourage the production of handicraft articles by the Eskimos and to handle the sale of these products.

At all posts it was found that the cumulative effect of Family Allowances was noticeable in the improved health of the children. The local administration of Family Allowances, which are paid in kind to the Eskimos, was efficiently handled. The Old Age Allowance of \$8 per month to Eskimos over 70 years of age, which was authorized the previous year, is being paid to a number of applicants who are making wise use of the allowance. At each point 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.

During the year, officers of the Administration devoted special attention to reporting on the educational needs of the Eskimo as the basis for planning an expanding program of education to fit them to meet changing conditions and the encroachment of civilization upon the region. *The Book of Wisdom*, an educational booklet prepared in Eskimo syllabic script and distributed by the Administration in 1947, was translated into the Eskimo language as expressed in the English alphabet and has been re-issued with added illustrations.

Engineering and Construction Service

The Engineering and Construction Service is the successor in the new Department of Resources and Development to the Engineering and Construction Division in the former Department of Mines and Resources. It functions as a general engineering and architectural unit in rendering advisory and supervisory service to the various divisions of the department in connection with all types of construction and maintenance. The service is composed of four divisions: National Parks Engineering, General Engineering, Architectural, and Administrative.

In addition to the Ottawa headquarters, district offices or resident posts were maintained at 13 locations, from Whitehorse in the Yukon to Ingonish in Cape Breton Island.

Under the direction of the professional and technical personnel, increased construction programs were again carried out for the National Parks and Historic Sites Division, the Yukon and Northwest Territories, and the Indian Affairs Branch. Some work was undertaken involving federal and provincial relations. The major part of the over-all program was on new roads and the improvement, paving, and preparation of other roads for hard-surfacing; the construction of steel and reinforced concrete bridges and the replacement of wooden spans with steel trusses; the construction of buildings, reservoirs, water systems, and a swimming pool. This involved field surveys, preparation of plans, bills of material, and estimates of construction costs of roads, bridges, water supply, drainage and power systems, and, in the case of building construction, the necessary plans and specifications. The maximum staff employed other than tradesmen and labourers was 133, an increase of 31 over the previous year.

Nearly all this work was performed under contracts arranged through normal channels. A very small percentage was carried out by day labour, but in all cases the work was under continuous supervision by the Engineering and Construction Service.

The supply of suitably qualified engineers and architects to design and supervise such undertakings has improved very little. Considerable difficulty is still being experienced in recruiting personnel for certain vacancies. As a consequence it has been necessary to obtain the services of architects in private practice to prepare or assist in preparation of plans on some of the projects and to follow out certain phases of supervision in the actual construction.

A detailed statement of the engineering and architectural work undertaken follows under three general headings: projects in national parks, C. Maxwell, chief engineer; projects outside national parks other than Indian Affairs, and projects for Indian Affairs, R. A. Campbell, chief engineer. C. H. Buck was in charge of architectural operations in all localities.

Projects in the National Parks

Banff Park

In Banff National Park on the Banff-Windermere Highway preparation was made for the erection of a steel truss bridge of 180-foot span over the Bow River. Abutments were completed and a contract awarded for the fabrication and erection of the superstructure. Investigations were made and reports prepared on all bridges in the park. Preliminary location surveys were carried out on proposed routes of the Trans-Canada Highway through the park.

Construction of Forty Mile Creek dam was completed and improvements and extension of the Banff water supply carried out as part of the over-all plan for the improvement of the drainage system. Installation of two sections of storm sewer was completed.

Kootenay Park

A contract was awarded for continuing the reconstruction and preparation for hard-surfacing of northerly sections of the Banff-Windermere Highway. When operations closed late in December, approximately 20 miles of highway had been graded and 18 miles gravelled. Highway work included a 40-foot span deck girder bridge erected over Haffner Creek Crossing and a 60-foot span deck girder bridge over the Kootenay River Crossing. Further work was carried out near the Radium Hot Springs end of the highway, improving the alignment. At the close of the fiscal year 4·86 miles of clearing and 1·3 miles of rough grading had been completed. The usual survey of bridge conditions throughout the park was made and plans laid for necessary replacements.

Improvements were made on the water supply system for Radium Hot Springs. Under the direction of the Architectural Division operations were carried forward on the construction of a new swimming pool and bath-house for tourists, which involved the provision of temporary accommodation for patrons at the existing pool while construction is in progress. Work was initiated in the 1949-50 fiscal year and will be completed by the autumn of 1950.

Yoho Park

Construction of piers, abutments, approaches, and superstructure for a four 55-foot span deck girder bridge over the Kicking Horse River near Field was completed. A contract was awarded for the replacement of the floor system on the Kicking Horse River bridge at Mile 4·69, and for the replacement of an existing wooden bridge by a multi-plate arch culvert at Mile 4·11, from the Great Divide on the Trans-Canada Highway. Preliminary location surveys were made in conjunction with those of the Banff area on Trans-Canada Highway.

Construction of a reservoir for a proposed water supply and distribution system at Field was planned and a contract awarded.

Jasper Park

The Engineering Division was responsible for the reconstruction and preparation for hard-surfacing of the highway from the townsite to the Eastern Gate. Crib protection at the crossing of the Rocky River was

found to be a necessity. The crushing and stock-piling of gravel, in preparation for the placing of a consolidated asphalt-bound gravel base course, was also started. The existing wooden bridge over the Fiddle River at Mile 30.2 was replaced with two 150-foot steel spans and the Snaring River bridge at Mile 10 was replaced with three 100-foot steel spans. Operations on the reconstruction and preparation for hard-surfacing of the Jasper-Banff Highway were continued. Approximately 42 miles of highway were cleared, 20 miles graded, and 16 miles gravelled. Nine miles of the Medicine Lake-Maligne Canyon Road were improved and fine graded. A 25-foot span reinforced concrete bridge was constructed over Whistler Creek. Bridges through the park were inspected and plans were laid for the necessary replacements.

The Upper Reservoir on Cabin Creek to supply water to Jasper town-site was completed with the exception of the pouring of the floor slab.

Under the Architectural Division operations continued on the construction (begun in 1948-49) of a swimming pool and bath-house as well as tennis courts, bowling greens and other recreational facilities for tourists. An existing building was moved to a new site and remodelled as a curling rink. An attractive building to serve as a fully equipped tourist bureau was completed, as was an addition to the existing fire-hall. Camp facilities for tourists at Miette were improved and a supervisor's residence was constructed.

In the park industrial area construction was initiated on four Quonset-type buildings to furnish accommodation for garage and workshop, storage for heavy automotive vehicles, storage of fire warden's equipment, and a laundry.

Waterton Lakes Park

A contract was awarded for continuing the reconstruction and preparation for hard-surfacing of the Akamina Highway, begun in 1948, and for the improvement of the Cardston and Pincher Creek Entrance Roads. The work closed down early in October. On the Akamina Highway 4.7 miles were graded and gravelled was carried out over the entire length of highway for 9.7 miles. The Cardston Entrance Road was graded and gravelled for 2.35 miles and the Pincher Creek Entrance Road for 6.7 miles. Plans were prepared for the replacement of the Cameron Falls bridge in Waterton townsite with a 65-foot span reinforced concrete deck girder bridge.

Prince Albert Park

Work begun in 1948 was continued under contract on reconstruction and preparation for hard-surfacing of sections of the Waskesiu Highway. When operations closed down in November approximately 14 miles of highway had been graded and gravelled and a 50-foot span deck girder bridge erected over the Spruce River. This completed grading over the entire length of the highway inside the park.

Riding Mountain Park

The main work was reconstruction and preparation for hard-surfacing of No. 10 Highway. This was begun in 1948 but was continued by a new contract. When operations closed down in November approxi-

mately 25 miles of highway had been graded and a base course of gravel applied. This completed grading over the entire length of the highway inside the park.

Point Pelee Park

Experimental beach protection work was carried out, using reinforced concrete crosses, round oak piling, and steel sheet piling at various sections of the park beach. The various protective works were severely tested by violent storms which lashed the shore following these installations and while final recommendations have not yet been made it is believed that use of one or other of the devices installed will be effective in preventing further erosion and building up the shoreline.

Fundy Park

A contract was awarded for the reconstruction and preparation for hard-surfacing of sections of No. 14 Highway in the park. With the close of work in November, approximately 12 miles of highway had been cleared, 11 miles rough graded, and 8 miles fine graded and gravelled. Surveys were carried out and plans were prepared for the Point Wolfe and Herring Cove Roads, as well as investigations for proposed bridge structures at Bennett Lake and Upper Salmon River. A water supply system for the park was installed.

Under the Architectural Division administrative and tourist recreational buildings were designed, contracts awarded, and supervision provided for the construction of an administration building, park superintendent's residence, park warden's residence, a tourist registration building, 16 attractive tourist cabins, and a fireproof bath-house with swimming pool. Also built during the year were a staff dormitory, dining hall and kitchen, stores building, road equipment vehicle building, and small garage.

Cape Breton Highlands Park

The work of reconstruction and preparation for hard-surfacing of sections of the Cabot Trail and on bridges and trestles was continued. Work closed down in November with approximately nine miles of highway having been graded and gravelled. Reinforced concrete deck girder bridges were erected over Black Brook, Still Brook, Halfway Brook, and the west branch of the North Aspy Brook. Two trestles over the North Mountain section also were erected. Work was started on the construction of the piers, abutments, and approaches for a four 55-foot span deck girder bridge over the Little River near Cheticamp. One pier, one abutment, and the approaches were completed when adverse weather halted operations in February. Designs were prepared by the Architectural Division for a series of attractive tourist cabins.

Prince Edward Island Park

A number of attractive tourist cabins were built from designs prepared by the Architectural Division.

Work for Northern Administrations

The Mackenzie Highway from the north boundary of Alberta to Hay River Settlement on the south shore of Great Slave Lake, a distance of 81 miles, was maintained in excellent condition for all traffic using it.

Additional information was obtained regarding the action of permafrost beneath the completed road when under traffic. The data thus obtained will be of great value in the future in connection with road maintenance under similar conditions.

In Yukon Territory work was resumed on the Whitehorse-Mayo-Dawson Road and an additional 103 miles was constructed between Carmacks on the Lewes River and Mayo on the Stewart River. A total of 131 miles of road has been completed of the estimated mileage of 367 between Whitehorse-Mayo-Dawson. When construction operations ceased in early December, preliminary work had been done on an additional 12 miles of this road. During the winter and early spring months preparations were made to permit an early start on construction operations on the section of road between Whitehorse and Carmacks. Fuels, lubricants, food, and supplies were stockpiled and camp buildings moved to Carmacks. Clearing and grubbing on 16 miles of this portion of the road were completed. Additional reconnaissances were carried out on other sections in order to find the best possible route.

A pre-fabricated combination barracks and residence was constructed for the R.C.M.P. at Minto. This was done by the road contractors while they were in the area, and resulted in a considerable saving over the estimated cost.

In the Northwest Territories additional work was done on a winter truck road between Hay River and Yellowknife. In the Hay River Settlement 1½ miles of townsite roads were constructed. All roads in the townsite were maintained, as well as the road to the fisheries settlement. Investigations were also made relating to sanitation and drainage control.

Plans were prepared and the necessary equipment has been assembled at Waterways (in preparation for the opening of river transportation in 1950) for the installation at Aklavik of a pure water summer supply system. A preliminary survey was made and plans and specifications prepared for the building of a water purification plant and the laying of a distribution system to supply Fort Smith with pure water for domestic use and to give fire protection to the settlement. The necessary materials were ordered and have been assembled at Waterways for the opening of navigation so that an early start may be made in 1950 on construction operations.

Inspection surveys were made for the improvement of roads and drainage systems in the settlements of Fort Smith, Fort Simpson, Fort Norman, Reindeer Depot, and Aklavik. Supervision was given to road improvement at Fort Simpson. The work was carried out by R.C.A.F. equipment and personnel.

Activities of the Architectural Division included designs for a two-roomed school with teacherage at Coppermine, and the required drawings and specifications were transmitted to the Department of Public Works. Designs for a similar school at Resolution were prepared and transmitted to the Department of National Defence. Estimates were prepared for an addition, which is contemplated by the local school authorities, to the school at Yellowknife. Estimate was prepared and bill of materials forwarded for anticipated quarters for Wildlife Division personnel at Frobisher Bay, Baffin Island.

Dominion-Provincial Projects

Supervision was maintained on the Cranberry Portage-Cuprus Mines section of The Pas-Flin Flon road which will extend for approximately 27.7 miles. This project is being built in co-operation with the Province of Manitoba, the Canadian Government contributing 50 per cent of approved expenditures.

Grading and gravel surfacing have been substantially completed on this section of road and the work remaining to be done consists of some rock excavation to provide reasonable sight distances, trimming up the work, the completion of two steel bridges at Baker's Narrows, and the placing of additional clay and gravel at locations where trouble has developed in the swamps.

Projects for Indian Affairs

In British Columbia various projects were undertaken by the Engineering Division in the Kamloops, Kwawkwalth, Skeena, Nicola, Bella Coola, Kootenay, Okanagan, Cowichan, Williams Lake, Lytton, Vancouver, Stuart Lake, and West Coast Agencies. This work consisted of the investigation and repair of damage done by flood conditions which occurred early in the spring, surveys of irrigation and drainage systems, and the planning of wharves, roads, bridges, and water supplies. After investigation and report to the Indian Affairs Branch, much of the work was completed by the Engineering Division.

The Architectural Division carried out an investigation with a view to improving conditions at the Cariboo Residential School at Williams Lake Agency. Furnaces were installed in a number of existing buildings, and a new building was designed to serve in the first instance as a dormitory, but which later can be used as a classroom block.

In the Stikine Agency complete designs were prepared by the Architectural Division, tenders were invited, and a contract awarded for the construction of a residential school at Lower Post, British Columbia, to provide dormitories, classrooms, kitchen and dining hall, chapel, staff quarters and toilet accommodation for 120 Indian pupils and necessary teachers and staff.

The projects undertaken by the Engineering Division in Alberta, Saskatchewan, and Manitoba consisted of bridges, water supply systems, and roads. Reports and cost estimates were prepared and work was carried out on some of the projects, while in other cases preliminary arrangements were made to undertake the work in 1950.

A modern building to serve as a dormitory for 50 pupils and staff, and as a residence for the agency assistant, was erected at Wabasca in the Lesser Slave Agency under the supervision of the Architectural Division. This structure was provided with a new water supply system, lighting plant, and sewage disposal facilities.

In this agency also designs were prepared and operations were initiated on the construction of a residential school at Hay Lakes, Alberta, to accommodate 160 pupils and staff.

In Ontario the Engineering Division carried out road survey work at Sioux Lookout and made inspections at the Six Nations, Tyendinaga, Caradoc, and Sarnia Agencies. A road investigation survey was made on

the Dokis Reserve at French River near North Bay. The major undertaking in this province by the Architectural Division was the design of a new two-room school with teacherage for the Kenora Agency. Tenders were obtained, contract awarded, and construction operations practically completed. The school will be opened early in the 1950-51 fiscal year. Other projects were: construction operations carried to completion on a new combined barracks and commanding officer's residence at Ohsweken, in the Six Nations Agency; adaption of several salvaged buildings for use as day schools at the Mohawk Institute in Brantford; and remodelling operations initiated to provide additional dormitory space in the Mohawk Institute Residential School.

In Quebec the Engineering Division was responsible for inspections relating to buildings and water supplies at Seven Islands, Bersimis, Lorette, and Caughnawaga. A domestic water supply main extension to tap an additional spring was installed for Lorette Indian Village. Other engineering work included 2.2 miles of gravel road construction at Restigouche Agency, a drainage inspection at Pointe Bleue, and road inspections and surveys at Pierreville and Caughnawaga Agencies. At the latter point inspection was provided for an office building being erected by the Indian Affairs Branch. An important project of the Architectural Division was the preparation of designs preparatory to inviting tenders for the construction of a residential school early in the 1950-51 fiscal year at Seven Islands Agency. The design provided for such features as dormitories, classrooms, and dining accommodation for 120 pupils and staff. Designs were also prepared for an agency office building and a residence for the Indian Superintendent, and a design was prepared for the construction of an agency office building in the Bersimis Agency. A design was also prepared for the construction of an agency office building for the Caughnawaga Agency.

In the Maritime Provinces a new water supply system was built at Tobique to supply all the houses with running water for domestic use and to furnish fire protection. Inspection of the water supply system in operation at the Shubenacadie Agency was carried out and a chlorinator was purchased and installed for the residential school. Other work of the Architectural Division included carrying out inspections and completing reports with estimates for repairs and replacements to plumbing and heating systems, electrical generating plants, domestic hot and cold water supply and sewage disposal facilities in buildings administered by the Indian Affairs Branch. Among these were:

British Columbia: Alert Bay, Kootenay, Kuper Island, Sechelt, Lejac, Cariboo, St. George's, and Kamloops Residential Schools.

Alberta: Edmonton, Blue Quills, and Old Sun Residential Schools.

Saskatchewan: Lebret, Gordon's, Muscowequan, Guy, and Duck Lake Residential Schools.

Manitoba: Brandon, Birtle, Pine Creek, and Sandy Bay Residential Schools.

Ontario: Fort Frances, Cecelia, Jeffrey, Kenora (R.C.), Mohawk Institute, and McIntosh Residential Schools; and Cape Croker Agency Office and Council Hall.

Quebec: Caughnawaga Eastern School.

Nova Scotia: Shubenacadie Residential School and the Indian Superintendent's Residence, Eskasoni.

Forestry Branch

D. A. Macdonald, Director

In the fiscal year covered by this report, the Federal Forest Service completed 50 years of activity. In all fields of forestry, including fire protection, tree planting, operation of national forests, and forestry and forest products research, it has pioneered and provided leadership throughout Canada.

Its activities during the first 30 years were in the main concerned with the administration and protection of some 34,000 square miles of national forests in the four western provinces, including all of the East Slope of the Rocky Mountains in Alberta.

However, the need for scientific management of national forests was recognized as early as 1917 by the initiation of a forest research program at the Petawawa Forest Experiment Station. Furthermore, in 1922 the Forest Service absorbed all the forestry functions of the Commission of Conservation. Consequently, when the natural resources were transferred to the jurisdiction of the four western provinces in 1930, a substantial foundation had already been laid for research, both fundamental and applied, and this now constitutes the chief function of the Forestry Branch.

Reviewing forestry developments in Canada over the past 50 years, certain broad trends are clearly apparent. Today there exists definite evidence of a transition from an attitude of forest exploitation to one of forest conservation, with recognition of the need for the application of science to forestry problems. Professional forestry has been firmly established and recognized as the backbone and directing force in the development of sound forestry practice. The important place now occupied by the professional forester is evidenced by the increasing demand for his services not only by governments but by the forest industries, whose enormous growth and development are outstanding factors in the national economy and the external trade of this country. Finally, the importance of forest wealth and the vital role the forests play in times of national emergency have at last awakened public consciousness to the need for protecting and conserving this great Canadian asset.

The Federal Forest Service has contributed substantially to forestry development in this country in the past 50 years. Its role in the future will be no less important, particularly in the light of the new Canada Forestry Act passed in December, 1949. This legislation can be of the greatest significance to Canada by reason of the fact that it provides a statutory basis for an over-all national forest policy to be worked out in co-operation with the provincial governments and the forest industries.

The activities of the Forestry Branch are not confined to Canada alone, but through its participation in Commonwealth conferences and the work of Food and Agricultural Organization of the United Nations, it has achieved international recognition in the field of forestry and forest products. The fact that Canada can play an important role in world forestry was recognized in April, 1949, when the Federal Government was requested by FAO to act as host, in co-operation with the pulp and paper industry, to the Preparatory Conference on World Pulp Problems, held in Montreal. The supreme position of Canada's newsprint and wood pulp industry in world markets was a significant

factor in the decision to hold this meeting in Canada. Out of this conference there emerged a greatly clarified picture of world pulp requirements, production, and pulpwood reserves—a picture of great value to all participating countries. Also, the need for improved statistics and statistical reporting by the countries concerned was underlined.

Canada also participated in the Third World Forestry Congress at Helsinki, Finland, in July, 1949. The Dominion Forester and a senior officer of the Forest Products Laboratories of the department were authorized to attend this conference. These officers, together with five others representing the forest industries and the universities, comprised a seven-man Canadian delegation.

The highlight of this world meeting was the recognition by all participating delegates from 33 countries of the need for a more practical definition of *Forestry*. The congress agreed that the sciences and techniques of forestry should not be limited to the solution of silvicultural problems as ends in themselves; rather it was emphasized that there is a whole set of physical, economic, industrial, and social factors which must be taken into consideration to form a new and broader concept of the term *Forestry*. This trend of thought that seeks a more practical definition of forestry is logical in view of the close interdependence between the wood-using industries and the forest.

The congress recognized and clearly stated that the forest cannot be regarded separately from the industries to which it supplies raw materials. The forester must adapt his methods of management so as to produce the quantity and kinds of forest products needed by industry. Similarly, it is the responsibility of technical research and industrial development to adjust conversion methods and uses to the limitations and requirements of sound silviculture. This basic principle was recognized by both foresters and businessmen attending the congress, and, consequently, assumes a major significance.

Apart from the valuable discussions and contacts afforded by this meeting of world experts, an unusual opportunity was presented to the Canadian delegates to observe the principles and practice of forestry in the Scandinavian countries, which have been developed over several hundred years.

There is much to be learned from this experience. However, forestry conditions which obtain in Finland, Norway, Sweden, and Denmark differ from those in Canada in respect to the number and variety of tree species and to social, economic, and physical factors. Consequently, Scandinavian forestry methods cannot be applied to Canadian forests. Canada must develop forest management systems in accordance with her own particular needs.

During the past 50 years forestry in this country, measured by every standard, has made substantial progress, and the foundation is solidly laid for future development. With the goodwill and energetic co-operation of governments, the industry, and the general public, Canada can look forward to even greater forestry progress in the half century ahead.

Forest Economics

The Forest Economics Section maintains statistics concerning the forest resources and forest industries of Canada. These statistics include an inventory of the forests, production and consumption data for the forest

industries, and figures on the volume and value of Canada's trade in wood and paper products. A digest of provincial and federal forestry legislation is maintained, together with changes in the forestry regulations of the provinces. The section acts as a source of information on these subjects for Government departments and for the public. Further, research in forest economics is carried on and analyses of economic developments in forestry are made. In its special field the section acts in an advisory capacity to the Director of the Forestry Branch and, through him, to the department as a whole.

The addition to the staff of a junior forester has allowed the section to carry on its activities more effectively and to expand its field of service.

In April 1949, the Preparatory Conference on World Pulp Problems was convened in Montreal by the Food and Agriculture Organization of the United Nations. In co-operation with officials of the Dominion Bureau of Statistics of the Department of Trade and Commerce, and of the Pulp and Paper Association of Canada, the section was responsible for the preparation of Canadian data used at the conference. It also aided in the organization of the conference, and its representatives acted as advisers to the Dominion Forester, who was head of the Canadian delegation. At the fifth annual conference of FAO, held in Washington, November 1949, the Chief of the Section attended as a technical adviser to the Canadian delegation.

The National Forest Inventory, which is undertaken periodically in co-operation with the provinces, was again compiled this year. The results were published in the *Amendment List—1949 to the Statistical Record of the Forests and Forest Industries of Canada*, and in the leaflet, *Canada's Forests, 1950*. Two thousand copies of the *Amendment List—1949* were printed and distributed. The distribution of *Canada's Forests, 1950* has been 10,000 English and 3,000 French copies.

Quarterly statistical reports of Canadian production, exports, and imports of forest products were sent to the Economic Commission for Europe, which is an agency of FAO. The section, in co-operation with the Dominion Bureau of Statistics, also prepared the annual statistical report on forest products for FAO. Forestry data were prepared for the publication, *Agriculture, Fisheries, Forestry, and Nutrition in Canada, 1949*. This serves as a progress and program report for FAO.

The Chief of the Section is serving on the Interdepartmental Sub-Committee on Labour Productivity Statistics as well as on a committee dealing with economic data in connection with the proposed *Atlas of Canada*.

Forest Research Division

Following the recent departmental reorganization, all forest research activities of the Forestry Branch were consolidated and placed under the jurisdiction of the Forest Research Division. Within the division, four sections were established, Silviculture, Forest Management, Inventories, and Fire Protection. The work of the Silviculture and Forest Management Sections is carried on by staff located at Ottawa and at the district offices at Fredericton, Quebec, Winnipeg, and Calgary. The Inventory and Fire Protection Sections, although conducting work in various parts of Canada, for the present operate from Ottawa only.

A preliminary reconnaissance was made of forest conditions in Newfoundland with a view to setting up a district office in that province during the coming year.

The technical staff of the division was increased by the employment of newly graduated foresters, both at Ottawa and in the districts. As a result of this, it has been possible to prepare reports on much of the past work and to undertake new research projects where the need for them was pressing. However, the policy has been to complete work on existing projects, previously curtailed by lack of staff, before undertaking new work.

Silviculture and Forest Management Sections

These two sections are concerned with those aspects of forest research related to the management of Canadian forests on a sustained yield basis, and to developing methods of silviculture concerned with regeneration problems and cutting methods which are applicable to various forest conditions. The Silvicultural Section obtains the basic information required by research and background surveys while the function of the Forest Management Section is to determine methods of applying this information under practical conditions.

Research projects concerned with more than one geographic area are handled by the head office staff. In this connection work was completed on the Canada-wide regeneration survey to assess conditions on cut-over and burned-over lands, and a report will be published in the coming year. Studies to devise methods of bringing cut-over areas of tolerant hardwoods back into productivity were continued and expanded both in Ontario and Quebec in co-operation with industry. *Silvicultural Research Note No. 95* covers one phase of this work.

Maritimes District

This district conducts work in the Provinces of New Brunswick, Nova Scotia, and Prince Edward Island. Two permanent experimental areas are maintained, one at the Acadia Forest Experiment Station, near Fredericton, and the other on the Green River drainage area near Edmundston, N.B. The latter is operated in conjunction with the Federal Department of Agriculture, the New Brunswick Government, and the Fraser Companies, Limited. A survey was made to examine another possible research area in Nova Scotia. Experiments were conducted on numerous other areas in co-operation with the provincial governments and various pulp and paper companies.

Stand development studies involved projects at Green River, Acadia, and on the limits of the Mersey Paper Company in Nova Scotia. At Green River, Research Block No. 5, an area of 4,000 acres, was established and sampled by line plots. The study of balsam thicket development at Acadia was continued and a number of natural areas in representative site and cover-types were established to study natural succession. A permanent sampling was established in over-mature hemlock stands on the Mersey Paper Company limits.

Reproduction studies on seed-bed conditions were continued at Acadia. The purpose was to isolate the effects of the various seed-bed treatments. Partial results from the experiment have been published in leaflet form. A new project was started in direct seeding to compare the results of manually prepared and tractor-prepared seed-beds.

Routine nursery work was continued at the Acadia Station and a project to study the control of damping-off and root rot in the seed-beds was started. Work on thinnings was confined to remeasurement and minor projects.

Two major projects in harvest cutting methods were established in Nova Scotia, in co-operation with the Nova Scotia Department of Lands and Forests and the Mersey Paper Company. One was designed to permit a comparison of the results of selection—diameter-limit—and clear-cutting in a mature coniferous stand, while the second involved diameter-limit and selection cutting in an all-aged red spruce stand. Sampling was established and the areas marked for cutting. A similar project was started at the Acadia Station in a 70-year old spruce-balsam stand.

Mensuration problems studied were: a check on the accuracy of line plot tallies, preparation of volume tables for the Green River Management Unit, and a study of tree form and crown characteristics.

The most important work in forest management was the preparation of a draft management plan for the Green River area, utilizing all available inventory and growth data obtained during the past five years. Field work for the Acadia working plan survey was completed by the establishment of permanent line-plots on 10 square miles of the station area.

Twelve previously established demonstration woodlots, operated in co-operation with the Federal Department of Agriculture, were inspected and marked. Plans for two additional woodlots were prepared.

A considerable amount of permanent improvement work was done at the Acadia Station. This included the erection of a fire tower, and the construction of a foreman's residence and six miles of forest road.

Quebec District

Two new observation areas, each comprising an area of about five square miles and sampled by 300 permanent line plots, were established on the Cyriac River and at Windsor Mills. The first area will provide information on the growth and development of the forest following clear-cutting and fire, while the latter will provide similar information on a forest which is being managed for sustained yield under a selective cutting system.

The classification of site types in forest section B.1, which embraces a large proportion of the pulpwood producing area of the province, was continued in the vicinity of Grand'Mère, Baie Comeau, Chibougamau, and on the Montmorency, Cyriac, and Sault au Cochon areas. An additional year of field work will be required to complete the classification and preparation of yield tables for the area. A small thinning experiment in stagnated stands of balsam fir was started, and plots were also established in an experimental harvest cutting area, both within forest section B.1.

Valcartier Forest Experiment Station

The grid of permanent line plots sampling the area was expanded and remeasured. Cutting operations under the management plan were continued. A new staff house was built and a small soil laboratory constructed in the basement of the office.

Ontario

Research activities were concentrated primarily at the Petawawa Forest Experiment Station, Chalk River, in order to clear up the back-log of work which had accumulated during the war years. The only other field party operating was engaged on a growth and yield survey in the Nipigon area. This work was undertaken at the request of seven pulp and paper companies in the region and in co-operation with the Ontario Department of Lands and Forests, to demonstrate a method of predicting growth and yield from the remeasurement of permanent plots established in representative age classes and forest conditions. A preliminary report was prepared, but another season of work is required before results can be published.

In co-operation with the Kalamazoo Vegetable Parchment Company at Espanola, an experiment was established to determine the efficiency of various cutting methods and seed-bed treatments in jack pine stands in order to obtain adequate reproduction following cutting.

Petawawa Forest Experiment Station

Since 1918, when work was first undertaken on this area, numerous long-term experiments in thinning and improvement cutting have been established, particularly in the red and white pine type and in the mixed stands of pine, spruce, and intolerant hardwoods. Field examination and office analysis for many of these projects were brought up to date so that publications can be issued on this phase of the work at an early date. A similar program was followed with reproduction studies of red and white pine.

Natural areas in typical undisturbed stands covering a range of cover-types and sites were sampled and permanently reserved from cutting for use as ecological reserves. The program of establishing demonstration areas which present the results of the more interesting experimental work in a readily observable form for visitors was continued.

Nursery and tree-breeding work was on a maintenance basis, pending the appointment of a tree-breeding specialist.

Cutting operations under the management plan were reduced, with only 600 cords of fuelwood and 200,000 feet of sawlogs cut during the year. Cutting operations on the demonstration woodlot were continued and preliminary work was done on the establishment of a 600-acre demonstration sustained yield unit.

Improvements to the station included rewiring the buildings, installation of a new water system, and the elimination of dangerous curves on existing roads.

Manitoba-Saskatchewan District

Problems concerned with the regeneration of white spruce, thinning in jack pine and poplar stands, and slash disposal were the major ones studied during the past year.

In Saskatchewan, a very intensive study was made to determine the factors that result in the presence or absence of white spruce regeneration on cut-over or burned-over lands, and attempts were made to relate the amount of regeneration to soil, vegetation, climate, and topography. In Manitoba, at the Riding Mountain Research Area, 2,000 regeneration plots were remeasured to study the effect on the establishment and

survival of white spruce seedlings of scarifying the forest floor with a tractor-drawn plow. Additional plots were established to continue the study in the next season. Other permanent plots in the same area were remeasured to study the effect of periodic drought on the survival of seedlings.

Three thinning projects in jack pine stands were active in Saskatchewan and one in Manitoba. Stands of different ages were thinned to varying densities, and the degree of thinning related to growth on the residual stand. In one of the Saskatchewan projects, an innovation in the method of thinning was introduced. Thinning was done in strips by a cable attached to a power winch. Costs of this method compared favourably to those of the more conventional procedure. Several sample plots, established for a study of thinning in poplar stands, were remeasured in Manitoba.

Two investigations concerned with the disposal of logging slash were started; they dealt particularly with the effect of the method on white spruce and jack pine regeneration.

The compilation of information pertaining to the rate of growth of white spruce and jack pine under varying conditions, collections for the herbarium, and phenological observations were continued.

Improvements to the headquarters site, Riding Mountain Research Area, included the installation of a water, light, and sewage system for the buildings used by the staff during the field season.

Alberta District

The majority of the silvicultural and management studies to date have been carried out in the Subalpine Forest Region, in which the Kananaskis Forest Experiment Station is located. The problems investigated include projects on growth and yield, thinnings, reproduction, site, and forest management.

An investigation of the growth and yield of white spruce in undisturbed mixedwood stands in the Boreal Forest Region of northern Alberta, which was started last year, will result in volume and yield tables of value to industry and forest research in that region. Similar studies on lodgepole pine are nearing completion in the Subalpine Forest Region, after the collection of permanent sample plot data over many years.

Because of the necessity of releasing young, dense, fire stands of lodgepole pine from stagnation, an investigation was made into the use of mechanical equipment, fire, and chemical sprays for thinning. The results were silviculturally very promising, but rather costly, and attempts are being made to reduce costs to a practical level.

Investigations of an exploratory nature to ascertain the site treatments necessary where natural regeneration is inadequate on logged-over areas were continued. Results from planting and from some methods of direct seeding have been encouraging. Rodent control, however, is a necessity in the case of seeding. Projects were initiated to determine the results of direct seeding of lodgepole pine, white spruce, and Douglas fir on open sites resulting from repeated fires. At the Kananaskis Forest Experiment Station studies in natural and artificial methods of regeneration of Douglas fir under aspen stands are under investigation. The effect of site on density of natural reproduction of lodgepole pine following fire is also being studied.

The soils of the Kananaskis Forest Experiment Station were classified pedologically, primarily as a basis for future work on forest site classification. A report on this work will be issued in the coming year.

Cutting operations under the forest management plan for the Kananaskis Forest Experiment Station were continued, 1,750,000 ft. b.m. of spruce saw-timber and 96,000 linear feet of fire-killed mine timber being sold under permit. Of particular interest on the station was a large-scale project concerned with the practical management of mature white spruce stands. The cutting was by selective logging to various densities, and a subsequent measurement will provide information on growth, stand development, and regeneration. Other management projects included practical methods for the management of young lodgepole pine stands for Christmas trees, and mature lodgepole pine stands for poles and posts.

Improvements at the Kananaskis Forest Experiment Station during the year were confined to remodelling internment camp buildings to provide additional sleeping, garage, and storage accommodation.

Inventories Section

No natural resource is better adapted to the detailed studies which have been made possible by air photographs than the forest, and this has given rise to a comparatively new field of research and practice, in which the Forestry Branch has pioneered, and in which its contributions have been basic to the establishment of a new science. The development of technique has gone hand in hand with the forest mapping of nationally administered lands and other areas of direct concern to the Federal Government.

During the year, graphs were prepared to indicate the relation between the average height of the dominant trees, which are generally more easily measurable in the air photographs, and the height of the tree of average volume, which is used as a basis for compilation and comparison of data. Studies of the relation between the degree of crown closure and basal area were conducted, the former being a measure of lateral crown growth and the latter being closely related to the increase in diameter of the tree's bole; it seems probable that consistent converting factors which will assist the forester in estimating timber quantities in conformity with his appraisal of crown closure in the air photographs will result. A field trip was made by three men to the Valcartier Forest Experiment Station, where hundreds of field checks were made of tree heights already calculated from the air photographs by means of photogrammetric methods as developed by the Forestry Branch; results were very encouraging. Field work was also carried out in the Bersimis Indian Reserve, on the north shore of the St. Lawrence River, in connection with the development of a special photo aid, consisting of a row of dots on film, designed for the measurement of crown closure on air photographs.

Revisions were made in the design of the "Moosehorn", an instrument which has been developed by the Forestry Branch for the measurement of crown closure in the field. The new model, in which the field of view has been considerably reduced, is not only much more compact and portable, but also minimizes errors caused by obliquity of view.

Further tests in the use of stereoscopic photo aids of an elongated character resulted in the construction of a working model of the "Stereo Tree Heighter", which enables a stereoscopic scale to be set down among the trees when they are seen in erect position under the stereoscope. This instrument promises faster results than the parallax wedge or other devices which depend on the use of floating dots and do not provide a full-length measurement of the tree image.

Assistance was given to several representatives of the forest industry, the provincial forest services, and the universities who came to Ottawa and engaged in studies of Forestry Branch developments in forest air surveys. Considerable progress was made towards the standardization of forest classifications and symbols, and assistance was given to the Province of Alberta in the drawing up of forest specifications for an extensive forest inventory which is being carried out under contract by a private company.

To a large extent air photography as conducted throughout the country during the past 30 years is documentary evidence of the history of the various forest stands, and a special effort was accordingly made to catalogue those details which would be important to the forester whenever he proposes to make use of the photographs.

Forest maps showing detailed quantitative estimates of saw-timber were prepared from air photographs and groundwork for an area totalling some 1,570 square miles lying along the Peace River in the Wood Buffalo National Park. These maps indicate the presence of excellent stands of spruce saw-timber. Similar maps were prepared for Fundy National Park, a 79.5 square mile-area situated on the Bay of Fundy in a location where wood is quite easily marketable.

General forest inventory maps were prepared covering 3,000 square miles in the Eastern Rockies Forest Conservation area, where their use for fire protection is of prime importance, particularly in regard to the stabilization of the flow of the Saskatchewan River. These maps are being reproduced in colour by photo-lithographic processes on the scale of one mile to one inch, with the co-operation of the Department of Mines and Technical Surveys. Forest maps were prepared for use in field work on a number of Indian reserves and Indian lands situated in Ontario and Manitoba, and totalling some 778 square miles.

Much of the research and forest mapping work has been dependent on the use of air photographs taken by the forestry tri-camera method under the auspices of the national Interdepartmental Committee on Air Surveys.

A great number of miscellaneous research and mapping projects, similar to or related to those described above, were carried out.

Fire Protection Section

Forest Fire Losses

For many years it was the practice to include in the annual reports of the Forestry Branch a statement of forest fire losses in Canada as compiled from information supplied by the various federal and provincial forest protection agencies. Last year, in order to provide for the publica-

tion of these statistics at an earlier date than was possible when they were included in the departmental report, a separate booklet entitled *Forest Fire Losses in Canada, 1948*, was issued.

This booklet permitted of a more detailed treatment of the subject than had formerly been given, and it is proposed to continue the same practice in future. Consequently, those who wish to obtain information on forest fires in Canada during the year under review should apply to the Chief, Forest Research Division, Forestry Branch, Department of Resources and Development, Ottawa, for *Forest Fire Losses in Canada, 1949*. Copies will be supplied free of charge.

Forest Fire Research

Petawawa

With a view to further improvement of methods developed by the branch for the measurement of forest-fire danger, certain basic field studies were continued at the Petawawa Forest Experiment Station. These included weather observations, moisture content determination in both fast- and slow-drying fuels, and experiments with hygroscopic chemicals. Tests of the effectiveness of wetting agents for extinguishing fires in deep-burning fuels, and of chemicals for retarding the growth of vegetation on fire-guards were continued.

Performance rating tests on two new models of portable power pumps were carried out. An improved model of the Wright hose vulcanizer was subjected to thorough trials, and an instruction manual for it was issued. This device should enable considerable savings to be effected by the repair of damaged fire hose which would otherwise be discarded.

Whiteshell

A fire-hazard research station was operated for the second year, in co-operation with the Manitoba Forest Service, in the Whiteshell Forest Reserve. Studies were made of fuel moisture and inflammability in relation to weather conditions, as a basis for modifying existing fire danger tables in accordance with the climate and fuel types of the Precambrian region. A provisional, simplified set of fire danger tables was prepared for experimental use. Data were obtained on the effect on the readings of instruments at forest weather stations of proximity to large bodies of water. This latter project has been undertaken in view of the frequent necessity of siting such equipment near lake shores, where the exposure is not typical of forest conditions.

A study of the effect of various methods of logging slash disposal on the subsequent fire-hazard was undertaken near Piney, Manitoba, in co-operation with the provincial forest service. Weather conditions were, on the whole, unfavourable to this experiment, and plans have been made to obtain additional data in 1950.

Co-operation was extended to the Manitoba and Saskatchewan Forest Services in the installation and operation of forest weather stations at which the Wright system of fire danger measurement, as developed by this branch, is in use.

Kananaskis

Fuel moisture and weather observations were continued on a restricted scale at the Kananaskis Forest Experiment Station, chiefly for the purpose of checking the allowance for the effect of weather inver-

sions which was recently incorporated in the fire danger tables prepared for that area. An investigation of meteorological conditions peculiar to mountainous regions was initiated, with a view to determining the prevalence and extent of such inversions, and means of predicting them.

General

Weather and fire danger records for all forest experiment stations and national parks were checked and verified for research purposes, as in previous years. Analysis of fire reports and fire danger records from New Brunswick was continued, with a view to assessing the reliability of the danger-rating system, and to interpreting the danger index in terms of preparedness required of the fire-control organization. Revision of the fire danger tables is now in progress.

Basic studies concerned with the determination of standards of adequate forest fire protection for the various forest regions of Canada were completed, and an outline report on the investigation was published. In conjunction with a forest management study undertaken by the Economics Section, an analysis of the cost of providing fire protection on a scale adequate for the practice of intensive forestry on a particular area was made.

Plans and specifications for an efficient but inexpensive lookout fire-finder were prepared, following a survey of existing types which was initiated by the Sub-committee on Forest Fire Research of the Associate Committee on Forestry. A paper dealing with some modern aspects of forest fire control in Canada was presented at the United Nations Conference on the Conservation and Utilization of Resources, held at Lake Success in August.

Two foresters were added to the staff of the section during the year bringing the total strength of the unit to nine.

Research Division Publications

Silviculture and Forest Management Sections

Silvicultural Research Notes

- No. 90: Reproduction of White Spruce in a Mixedwood Stand Following Mechanical Disturbance of the Forest Floor. D. I. Crossley.
- No. 91: The Dwight Cofrequency Principle in Diameter Growth Analysis. L. A. Smithers.
- No. 93: Characterization and Comparison of Forest Stands by Means of Phytographs. J. S. Rowe.
- No. 94: Forest Development on the Goulais River Watershed 1910-1946. D. W. MacLean.
- No. 95: Improvement Cutting in Tolerant Hardwoods. D. W. MacLean.
- No. 97: Management of Spruce on the East Slope of the Canadian Rockies. L. A. DeGrace.
- No. 98: Experimental Cutting in an Old Red Spruce Stand in Southern New Brunswick. C. C. Thomson.

Silvicultural Leaflets

- 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 for Four-foot Wood. D. E. Nickerson.
- No. 31: A Simplification of the Continuous Inventory Method of Calculating Diameter Growth. L. A. Smithers.
- No. 32: Reduced Yield in a Dense Balsam Fir Stand. C. C. Thomson.
- No. 33: Simplified Plane-table Orientation. E. S. Atkins.
- No. 34: Releasing Conifers in a Young Hardwood Stand. C. C. Thomson.
- No. 35: Direct Seeding with Red Pine in Central New Brunswick. C. C. Thomson.
- No. 36: The Advantages of Cleaning Coniferous Plantations when Competing Vegetation is Leafless. C. C. Thomson.
- No. 37: Comparative Moisture Regimes of Humus and Rotten Wood. I. C. M. Place.
- No. 38: Origin of Reproduction on Black Spruce Swamps. I. C. M. Place.
- No. 39: Windfirmness of Residual Spruce and Fir. Place and Kelly.
- No. 40: The Identification of Spruce Seedlings. I. C. M. Place.
- No. 41: Control of Contrast in Forest Stand Photography. L. A. Smithers and J. W. Summers.
- No. 42: Chemical Thinning of Young Stagnating Lodgepole Pine Stands. D. I. Crossley.

*Fire Protection Section**Research Notes*

- No. 10: Forecasting Weather and Forest Fire Hazard from Local Observation. H. W. Beall (reprinted 1949).
- Misc. Pub. No. 1: The Wright Hose Vulcanizer. R. W. Chorlton.

Leaflets

- Forest Fire Losses in Canada, 1948.
- Press Release, Forest Fire Losses in 1948.
- Forest Fire Danger in Midwestern Canada. H. W. Beall, J. C. Macleod, A. Potvin.
- Some Modern Aspects of Forest Fire Control in Canada. (Published by UNESCO.) H. W. Beall.
- Chemicals for Forest Fire Fighting (for Sub-committee on Forest Fire Research, Associate Committee on Forestry. Restricted distribution). D. G. Fraser.
- (a) A Review of Literature Concerned with Bombing Forest Fires from the Air.
- (b) Status of Research on Forest Fire Protection Problems Recommended for Study by Associations of the Forest Industries in Canada.

Articles

- An Outline of Forest Fire Protection Standards. For. Chron. 25:2, 1949. H. W. Beall.
- Measurements of Maximum Night Relative Humidity. For. Chron. 25:2, 1949. J. C. Macleod.

*Inventories Section**Publications*

- No. 5: Some Tests on the Determination of Tree Heights from Air Photographs. A. J. Nash.
- No. 6: Air Photography and its Application to Forestry. H. E. Seely.

Leaflets

- No. 4: The Seelyscope. G. A. Spear.

Forestry Operations Division

The chief duty of this new division is the implementation and administration of those functions which have devolved upon, and may in future be assumed by, the branch in consequence of certain co-operative arrangements made possible under the Canada Forestry Act.

This legislation, which was enacted by Parliament in December, 1949, provides, among other measures designed to promote sound forestry practice in Canada, that the Minister of Resources and Development may enter into agreements with any province for the protection, development, and utilization of the forest resources. Arrangements may also be made with other departments of the Federal Government for carrying out the provisions of the Act.

The Operations Division at present consists of an Education Section, an Indian Affairs Section, and a Parks and Northern Administrations Section, reports on the activities of which are given below. Provision has also been made within the division for a Provincial Agreements Section. In view of the recent date of the enabling legislation, however, and of the need for care and deliberation in seeking a sound and equitable basis for agreements with the various provincial governments, the functions of this section have so far been confined very largely to the assembly and analysis of statistical data and other information that may be of assistance in finding such a basis.

Education Section

The Education Section distributed 40,000 pieces of forest literature to schools, universities, libraries, and to professional and lay groups throughout Canada. Publications were also mailed to organizations in the United States and abroad with which exchange services are maintained.

During the dangerous forest fire season, through the co-operation of the Post Office Department, mail from 14 key cities throughout Canada was cancelled with special stamps bearing the slogans "Stop Forest Fires" and "Prevent Forest Fires".

A new edition of *Bulletin 61—Native Trees of Canada* was released in September with a run of 25,000 copies. The reception of this book was such that a second edition is being considered. Work was started on the French edition of *Native Trees of Canada* and the translation of the text is well under way.

A new publication entitled *A.B.C.'s of Forest Fire Prevention* has been prepared for use of the junior grades in public schools. This booklet will also be issued in French.

Indian Affairs Section

The project of making a forest inventory of lands in Indian reserves, started in 1948, was continued in 1949. As in 1948, work was confined to the Indian reserves located in Ontario. The year's activities can be roughly divided into three parts: forest inventory of reserves selected following a reconnaissance survey the previous year; a reconnaissance survey to select reserves to be covered by forest inventory in 1950; and the inspection, during the winter months, of logging operations under permit or licence.

Forest Inventory

Two parties were in the field in 1949 to survey reserves which had previously been photographed from the air and from which type maps were made available to field parties. In order to prepare a rough 10-year management plan, important subtypes were cruised to determine such factors as cubic and board foot volume, age, and growth. During the winter months work was started by the two party chiefs to compile these data, and by the end of March the preparation of these management plans was well advanced.

The following areas were surveyed in Ontario during 1949:—

	Approximate Area
I.R. No. 2 — Henvey Inlet	22,600 acres
I.R. No. 3 — Point Grondin	10,000 "
I.R. No. 5 — Spanish River	22,400 "
I.R. No. 6 — Whitefish Lake	45,900 "
I.R. No. 7 — Serpent River	18,000 "
I.R. No. 8 — Mississagi River	4,200 "
I.R. No. 9 — Dokis	39,700 "
I.R. No. 10 — Nipissing	12,300 "
I.R. No. 11 — Wahnapiatae	2,600 "
I.R. No. 12 — Thessalon	2,300 "
I.R. No. 13 — Lower French	6,300 "
I.R. No. 14 — Garden River	28,000 "
I.R. No. 16 — Parry Island	18,500 "
I.R. No. 17 — Shawanaga	8,300 "
I.R. No. 17A — Naiscoutaing	2,600 "
Beaucage Township	13,200 "
Commanda Township	18,000 "
Kehoe Township	14,800 "

It is anticipated that management plans on these areas will be completed and forwarded to the Indian Affairs Branch before survey parties leave for the field in 1950.

Reconnaissance Survey

The purpose of these preliminary inspections was to determine whether a reserve was sufficiently forested to make a management plan worth-while and, at the same time, to obtain information regarding camping sites, the best methods of transporting men and equipment to them, and any other information which would assist a survey party cruising the reserve at a later date. As a result of this reconnaissance survey a number of Indian reserves were selected for a forest inventory survey during 1950.

The following reserves were covered by this reconnaissance survey.

I.R. No. 11	I.R. No. 31J
I.R. No. 16D	I.R. No. 32A
I.R. No. 17A	I.R. No. 32B
I.R. No. 17B	I.R. No. 32C
I.R. No. 18B	I.R. No. 33B
I.R. No. 18C	I.R. No. 34A
I.R. No. 21	I.R. No. 34B
I.R. No. 22A1	I.R. No. 34C
I.R. No. 22A2	I.R. No. 35C
I.R. No. 23	I.R. No. 35D
I.R. No. 23A	I.R. No. 35E
I.R. No. 23B	I.R. No. 35G
I.R. No. 25D	I.R. No. 35H
I.R. No. 26A	I.R. No. 35J
I.R. No. 26B	I.R. No. 36
I.R. No. 26C	I.R. No. 37
I.R. No. 27 —Eagle Lake	I.R. No. 37A
I.R. No. 27 —Wabigoon Lake	I.R. No. 37B
I.R. No. 29 —Islington	I.R. No. 37B
I.R. No. 29 —Swan Lake	I.R. No. 38A
I.R. No. 31B	I.R. No. 38B
I.R. No. 31D	I.R. No. 38C
I.R. No. 31E	I.R. No. 39
I.R. No. 31H	I.R. No. 39A
I.R. No. 31G	I.R. No. 40

Timber Permit Inspection

During the operating season, timber permit inspections were made on the following Indian reserves:—

I.R. No. 4 —Whitefish River	I.R. No. 14 —Garden River
I.R. No. 5 —Spanish River	I.R. No. 26 —Manitoulin Island
I.R. No. 6 —Whitefish Lake	I.R. No. 27 —Eagle Lake
I.R. No. 7 —Serpent River	I.R. No. 27 —Wabigoon Lake
I.R. No. 13—French River	I.R. No. 38C —The Dalles

Short reports resulting from these inspections were prepared and forwarded to the Indian Affairs Branch. These reports deal with the amount of wood being cut, conditions following cut, whether or not agreements are carried out, whether dues are being paid, and recommendations for future operations.

National Parks and Northern Administrations Section

In view of the numerous requests for advice on forestry matters received from the National Parks Service and Northern Administrations, it was decided to create the position of Forestry Liaison Officer, with headquarters at Calgary, to deal with this situation. H. L. Holman, whose knowledge of the areas chiefly involved is extremely comprehensive, was appointed to the position.

During the period April to November, a reorganization of the forest and wildlife services in the Northwest Territories was undertaken. The resignations of two senior officials and their replacement by appointees unfamiliar with the area and the work, made it desirable for the liaison

officer to remain on the spot during the summer, the period of greatest activity, while circumstances necessitated his assuming the duties of District Administrator during September and October.

November and December were spent chiefly at Ottawa, save for inspection trips to the Fundy and Prince Edward Island National Parks in connection with forest protection and matters relating thereto.

In addition to the foregoing, a partial list of matters dealt with includes: training courses for wardens and rangers at Fort Smith (March-April, 1949) and Banff (February-March, 1950); review and revision of fire plans for the Mackenzie District for the 1950 season; similar work on plans for development of Wood Buffalo National Park; inspecting and reporting on cutting operations on licensed berths and on national parks; correspondence respecting conditions under which permit cutting on national parks should be allowed; consultation with the Entomological Division, Department of Agriculture, with regard to 1950 insect control work; discussion of certain sanitation cutting needed in Banff Park during the coming season; correspondence regarding new fire-fighting equipment for national parks and the Northwest Territories; and acting as liaison between the Forestry Branch and Northern Administrations in connection with a forest reconnaissance that will be carried out in the Mackenzie District during the summer of 1950.

Forest Products Division

In the organization of the Forestry Branch in the new department, the Forest Products Laboratories at Ottawa and Vancouver have been grouped under a new Forest Products Division, with J. H. Jenkins as Chief.

Research into the basic properties of Canadian commercial woods, and studies with a view to more efficient and economic utilization of timber products continue to occupy the scientists and technicians at both laboratories. Close contact with the wood-using industries is maintained at all times in order to orient research toward the solution of general problems, while specific requests from industry make possible co-operative effort in solving immediate problems. There is a continuous outward flow of technical information as project work advances, and in reply to specific requests for data. Many special investigations and tests are made on requests from industry, and many studies are initiated in co-operation with industry to enable research under actual operating conditions.

The Division Chief attended the Third World Forestry Congress in Helsinki in July, the F.A.O. Wood Chemistry Meeting in Brussels, and the F.A.O. Wood Technology Conference in Geneva during August. These international conferences served to emphasize the vital importance of the role played by forests in world economy, and to stress the urgent need for research in the many fields of forest conservation and utilization.

More generally, the work of organizing the new Forest Products Division was started, as was the over-all planning of research work to be carried out next year at both laboratories. In this latter aspect, and in addition to the continuance of general work already in progress, it was deemed desirable to lay particular stress on work aimed at improving present utilization and developing new uses.

Ottawa Laboratory

Urgently needed additional space (5,000 square feet) was occupied in June, when erection of an annex to the laboratory was completed. The transfer of some sections to the new unit permitted the allotment of more space to sections remaining in the main building.

Numerous conferences and association meetings were attended and staff members participated in the preparation and revision of specifications of the Canadian Standards Association and the National Building Code. There was continued activity in research problems that are international in scope and necessitate co-operation with other laboratories and standardizing bodies. General and committee meetings of numerous national and international associations were attended by members of the staff, and the laboratory continued to participate in organized efforts aimed at a fuller realization of the importance of forest resources and at exploring avenues for more economic utilization.

An Advisory Committee of Industry was organized to permit the closer integration of research work with problems arising from industrial operations. A consultative council of this kind will express the industrial viewpoint on many of the problems of research and thus facilitate appraisal of technical and economic production difficulties. A technical working committee on wood preservation was formed, and has proved so useful that it is intended to set up similar committees in connection with some of the more important phases of the work of the laboratory.

For the fourth consecutive year, 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 posting overseas.

Requests for technical assistance continued at a high level throughout the year. Many visitors came to the laboratory seeking advice, and to discuss their problems. Information requested often had to be obtained by making brief tests or minor investigations.

There was a considerable increase in the distribution of general technical information in the form of mimeographed reports and reprints. A number of articles were prepared for Canadian and foreign publications, and several technical papers were presented before research associations.

A paints and coatings laboratory, with a specialist in charge, was organized and equipped as a unit of the Wood Preservation Section. Projects were planned and initiated and some preliminary results are now available.

A small experimental sawmill has long been considered essential for the purpose of making exact studies of log size, sawing practice, and other factors affecting the output of lumber, in relation to log volume. A large building has been obtained and considerable progress made towards the securing and installation of machinery and equipment.

Timber Mechanics Section

Testing of the mechanical and physical properties of rock elm (*ulmus Thomasi*) was continued. Compilation of test data for red pine was completed, and data from two shipments of eastern hemlock, tested green, were compiled and are ready for the preparation of final summaries. Compilation of data from air-dry shipments of hemlock was well advanced.

The 47-foot arch of glued-laminated construction was loaded to destruction. Failure took place at approximately four and one-half times

the design load. This test to failure, and the result of previous loading tests during the preceding 18 months, indicate that, for long-term loading, the design assumptions were sound.

Tests of some 1,200 eastern spruce joists, to derive safe working stresses for lumber graded in accordance with Maritime Lumber Bureau grading rules, were analyzed. This work was undertaken so that design stresses could be determined for spruce lumber not specially selected for its load-carrying capacity. This will permit the economical use of yard lumber in places where, because of lack of knowledge as to its load-carrying capacity, oversized material would otherwise have been used.

Testing of a number of experimental wallboards produced from wood waste materials was undertaken for industry. Experimental hard-pressed and insulating boards, produced in another unit of the laboratory, were also tested. This work was intended to assist in the development of products acceptable for house construction.

A comprehensive study of the relative weathering qualities of plywood adhesives was initiated in order to determine their durability under severe service conditions. Results obtained from outdoor rack exposure studies will be compared to data secured through accelerated ageing test methods by use of a weatherometer and other means. It is hoped that in this way it will be possible to devise a method that will permit rapid and accurate evaluation of adhesives, and that it will no longer be necessary to have recourse to long exposure testing, such as is at present necessary.

At the request of the Hardwood Veneer and Plywood Association, a series of tests to establish a basis for the standardization of Canadian hardwood plywood was carried out. The project involved testing several thousand plywood specimens made up with various adhesives and various thicknesses of veneer.

A number of problems connected with the gluing of plywood and plywood utilization were submitted to the laboratory by the Department of National Defence. At the request of the department, a study was commenced to determine whether, by means of glued laminated construction, satisfactory substitutes for solid walnut rifle furniture could be produced, in the event that the supply of this wood should prove inadequate in an emergency.

Studies of methods for the rapid production of curved plywood were continued. A moulding system was designed and constructed, and numerous sample sections were bonded by dielectric heating both to test the process and to demonstrate the suitability of curved plywood sections for a variety of uses.

Basic research on the dielectric properties of wood was continued. The relationship between the density of wood and its dielectric properties indicated by previous studies was confirmed. This information is of value in the industrial application of dielectric heating to the edge-gluing of lumber, in that it will serve in the determination of optimum glue spread, power requirements, and the durability of joints made by this process. An important advance was made through the development of a method of measuring the radio-frequency energy expended in a gluing operation. This will have a direct influence upon the application of the dielectric technique to industrial gluing problems.

Research studies of new box designs resulted in the development of a new type of container having greater strength and rigidity than any previously developed. The new type can be adapted to a variety of

uses, and will be particularly valuable where heavy loads have to be carried, or where it is necessary to afford special protection to fragile goods. In addition, investigations have already made it apparent that there can be an economy of material without loss of efficiency. The design lends itself to the use of special closures, and has been found particularly suitable for use where ease of opening and re-use are factors.

A number of crate designs for packing machinery parts and technical apparatus have been prepared. Studies of the relation between torsional rigidity and design, to determine the best type of pack for goods subject to damage by distortion of the container, have been commenced. Comparison of this method of test with the established method in diagonal compression is expected to aid in the design of crates that will withstand distortion.

The barrel and keg manufacturing industry has requested the co-operation of the laboratory in surveying the possibility of reducing costs by the use of moulded staves and headers. Moulding should permit the use of a cheaper material and may make possible utilization of waste from other wood-using industries. Standardization would simplify cooping operations and it would also facilitate re-use, since barrels could be taken apart for return shipment. A method which gives considerable promise of meeting the requirements of industry has been studied, and concrete results should be obtained in the near future.

A number of technical problems submitted by industry and by government departments continues in volume. Among these may be cited problems related to gluing technique, properties of adhesives, uses and application of plastic overlap, effect of temperature on glued joints in furniture, gluing impregnated canvas to shuttle blocks to improve resistance to wear, redesign of poultry boxes, and the design and development of a new type of cheese box introducing a radical departure from the design now in use. Other problems involved the testing of fibre and binder-boards for inclusion in domestic building specifications, and the testing of alternative bridging techniques for floor construction.

Close liaison was maintained with the Canadian Standards Association in connection with the preparation of standards for eastern cedar and western red cedar telephone poles, and with the American Society for Testing Materials, in assisting in the development of standard test methods for poles.

Wood Preservation and Pathology Section

Preservatives

A study to determine the preservative value of three relatively new preservatives, pentachlorophenol, copper naphthenate, and lignite tar distillate was begun. Laboratory tests and accelerated field tests on small pickets were carried out to determine the relative value of these preservatives, as compared to standard creosote. The work is not yet sufficiently advanced to warrant definite conclusions.

A large number of hardwood and jack pine ties were treated with three concentrations of copper naphthenate in a light petroleum oil and in a heavy residual oil. Penetration and absorption secured with both types of oil were satisfactory for jack pine. Only the light petroleum oil gave satisfactory results with hardwoods. These treated ties were installed in track for a study of their service life.

Staff members inspected several installations of ties, fence-posts, and pickets, treated and installed under laboratory supervision for service tests. Work was continued on the collection of data on the service life of installations of treated and untreated timbers. To date, 1,136 tests have been recorded, and 824 are still active. Reports on active installations, received yearly from co-operating agencies, were recorded and tabulated.

The remaining posts in groups of untreated fence-posts of 19 species under test were removed during the year because of decay. Calculations of the average life of untreated fence-posts of these species were made.

To complete the tests on the steeping treatments of 1,200 fence-posts of six common Canadian species treated with copper naphthenate, pentachlorophenol, and mixtures of these, in two different types of petroleum solvents—fuel oil and waste crankcase oil—final calculations were made to determine average absorptions. There was a markedly superior absorption of preservatives dissolved in fuel oil; this applied to all species tested except white spruce, which is difficult to treat with any type of preservative.

On request of Committee P.6, American Wood Preservers' Association, a report was written comparing the method used at this laboratory for carrying out accelerated laboratory soil-wood-block tests on wood preservatives with the Leutritz method in general use by other investigators. The method used in this laboratory has the advantage of shortening the time necessary for obtaining results.

There is, in Canada, an increasing use of Greensalt (a mixture containing chromium, copper, and arsenic) as a preservative for treating poles. During the year the laboratory developed a relatively simple colorimetric method for determining copper and chromium in Greensalt solutions. It can be simply and quickly carried out by treating-plant personnel without the services of a skilled chemist, which were needed for the previously used chemical analytical method.

Untreated cable reels of white pine, now used in Canada, have a relatively short service life because of decay attributable to their service conditions. Component parts of eight cable reels were given full-cell pressure treatments with Greensalt preservative. The service life of these will be compared to that of untreated reels, and of reels brush-treated with petroleum solutions of other preservatives.

Jack pine poles were pressure-treated with a light petroleum oil solution of copper naphthenate to determine the penetration secured with an 8-pound empty-cell treatment, and to determine whether paint could be satisfactorily applied to poles so treated. Twenty of the treated poles were reserved for installation to determine their service life.

Pathology

The study of end-coatings, initiated in the hope of reducing the heavy losses (estimated at about \$2,000,000 annually) which occur in birch logs in storage, was continued. Thirty coatings were originally tested; of these, 11 were tried out during the summer of 1949 on white birch bolts stacked in the laboratory yard; three of these showed considerable promise. In the autumn of 1949, field tests were started. In the first test, the ends of sound green bolts of yellow birch were treated with sodium pentachlorophenate and the coating which had proved most efficient in preliminary trials. After two months exposure the bolts so treated showed little end-checking, and an average of only 1.9 inches of decay in com-

parison with 8.1 inches in the untreated controls. In the second test, 77 yellow birch logs were selected at the felling site, and treated in groups with four coatings combined with toxic chemicals. The project is being continued.

Manufacturers and users of pine poles are viewing with concern the chocolate brown fungal stain which develops in the sapwood of red pine and jack pine poles in storage. A study was initiated to determine to what extent this discoloration reduces the strength of the wood. Work to date has been limited to determining the best method of artificially producing this fungal stain on test material. Preliminary work indicates that the fungus may be *Cytospora*, probably an undescribed species.

A study is being made of fungi whose spores are prevalent in the air of lumber-seasoning yards. The spores were trapped on agar plates exposed in two yards. Wood-rot and wood-staining fungi were obtained and a number which appear to belong to the latter group have been grown on blocks of red pine sapwood in pure culture. A record of the effect of each on the wood is being prepared. Considerable variation is found in single-spore cultures of many of the wood-rot fungi. Pairing of mycelia thought to belong to this group has been carried on in an attempt to identify the species and to eliminate duplicate cultures.

The use of vermiculite as a substitute for soil in decay tests is under study. Extracts of vermiculite were found to have no effect on the growth of five common wood-rot fungi in plate culture.

During a lengthy track experiment, many secondary wood-rot fungi have been isolated from jack pine railway ties removed and analyzed. The relative ability of some 40 of these to rot jack pine was tested in pure culture. Loss in weight of culture blocks caused by these fungi during a four-month period was determined; a majority of the fungi produced serious decay.

The study of fungi responsible for decay of different species of wood was continued; specimens of rotted wood, and sporophores and cultures of wood-rot fungi have been added to the collections.

Wood Paints and Coatings

Exposure tests to determine the durability of exterior coatings on various species of Canadian woods were initiated during the year. Test fences were erected at Ottawa and Chalk River and painted panels have been exposed.

It has been noted during the exposure of painted wood siding that the paint film deteriorates in many ways other than by natural erosion. A study is being made to determine the fundamental causes of this deterioration. Two types of primers and three types of finish coatings are being used over nine species of wood in this study.

In collaboration with another unit, 60 plywood panels were coated for exposure tests. Each panel was primed with exterior white primer and then one-half was painted with exterior white paint. On the first examination, the halves that were primed only showed some cracking of the film over the vessel cavities of the veneer. No evidence of deterioration was observed on the other halves.

At the request of the Canadian Lumbermen's Association, an investigation to establish the painting qualities of various grades of red pine was started. A progress report indicated that, except on clear, sound wood, a coating of aluminum or shellac over the entire surface was necessary to obtain uniformity of surface finish with subsequent paint coatings.

Accelerated tests are being carried out in a weatherometer. Microscopic examinations of the accelerated test panels have shown some causes of deterioration to be due to variations in exudation products in the different species.

Wood Chemistry Section

Studies of the chemistry of black spruce bark, with particular reference to the resistant cork-like fraction, were continued. About 20 sub-fractions have been isolated from this material, including a carbohydrate fraction, a ligneous fraction, and a fatty acid fraction. From a study of its properties, this latter compound appears to be a dihydroxy, dibasic acid.

The above investigation provided evidence to indicate that in black spruce bark there is a possible combination of fatty acids with both carbohydrates and ligneous components. This combination of materials is chemically quite resistant, and its presence in the bark may explain the difficulties encountered in attempting to remove lignin completely from bark, either by pulping techniques or by the use of sodium chlorite for the isolation of the holocellulose fraction.

At the request of the Fundamental Research Committee of the Technical Section of the Canadian Pulp and Paper Association, a comprehensive investigation to determine the chemical composition of the more important Canadian pulpwood species was undertaken. Samples have been obtained from black spruce, white spruce, balsam fir, jack pine, aspen poplar, white birch, and several minor species. Laboratory work on the samples has thus far been restricted to physical measurements. Fibreboards were prepared from various types of wood waste. Extensive work was carried out on the preparation of insulating boards from varying proportions of the waste components (shingle hay and sawdust, wood, and bark), from western red cedar shingle mills. The defibering equipment used was a disc-type attrition mill. Results thus far indicate that satisfactory boards can be prepared from various mixtures of the waste. The physical properties of the boards improve with a decrease in the amounts of shingle hay and sawdust used. Some experimental wallboards were also prepared from white and red pine mill waste.

A limited number of hard-pressed boards were made from birch veneer waste, spruce bark, and mixtures of these two materials. Boards prepared from mixtures were of better quality than were those produced from pure materials. A hard-pressed board of good mechanical strength was obtained using 80 per cent sawdust and 20 per cent of chemically treated spruce bark as a binder.

Some research work was done on the extraction and use of tannin from white spruce bark.

Experiments on the electrolysis of sulphite waste liquor were continued. Various types of cells for batch and continuous operation were studied with a view to developing a method for the reduction of the calcium content of the waste liquor prior to evaporation, thus preventing serious scaling troubles during that process. The influence of electrolysis on yields of vanillin produced by oxidation of waste liquor with nitrobenzene in alkaline solution was also investigated. It was found that anolytes yield more vanillin than untreated sulphite waste liquor, when both are subjected to the same conditions of oxidation. This indicates

that anodic oxidation possibly produces compounds intermediate between lignin-sulphonic acids and vanillin. Oxidation at atmospheric pressure produces higher yields than oxidation in an autoclave at 160°C. Preliminary experiments were carried out in the utilization of electrolyzed waste liquor as a tanning agent. It was considered possible that electrolytic decalcification of the liquor might improve its tanning properties.

Wood Utilization Section

Logging and Milling

The initial phase of a study of sawmill waste and its utilization, begun three years ago, and covering over 50 representative sawmills in Eastern Canada, was completed. The resultant data were analyzed and a laboratory report prepared. It was found that, on an average, 50.5 per cent of the volume of softwood logs and 48.7 per cent of that of hardwood logs is converted into lumber. Both log diameter and length have an important bearing on output, and the degree to which these and other factors affect lumber recovery will be shown graphically in reports now being prepared for distribution.

The study indicated that an average of 176 cubic feet of solid wood in the form of softwood logs and 189 cubic feet of hardwood logs was required to produce 1,000 feet board measure of lumber. The average ratio of board foot to cubic foot is 5.7 for softwood logs and 5.4 for hardwoods.

More lumber was sawn from spruce logs than from white pine or hardwood logs of equal size, chiefly because of less intensive edging and trimming on spruce. The band headsaw/band resaw type of mills appeared more efficient in Eastern Canada, but the twin circular headsaw/resaw type was very suitable for sawing small low-grade logs. These observations apply only to mills at which studies were made, and their confirmation requires further investigation.

Plans were advanced for the establishment and operation of an experimental sawmill in Ottawa. Specifications were prepared for a circular headrig with separate power units for both headsaw and carriage, and tentative working plans were developed for the study of a large number of factors, such as saw-tooth form and spacing, ratio of swage to gauge, optimum feed speeds and saw speeds, finishing qualities of various saws, use of high-speed thin saws, and various metals for saws and saw teeth.

During the summer of 1949, exploratory investigations were made in the field to develop methods of collecting data in connection with a proposed logging waste study. During the course of these preliminary surveys enough information was collected to indicate the probable scope of the study. It was also determined that different techniques would have to be employed on areas cut for sawlogs and areas cut for pulpwood.

Lumber Seasoning

A limited amount of exploratory investigation was carried out to determine the amount lost financially and by volume from de-grade caused by seasoning defects in 2-inch maple. Sufficient testing was done to indicate that a considerable amount of minor checking occurred during air-seasoning and that this checking increased during the kiln-drying period.

Well-attended lumber seasoning courses were again held. Most of those taking these courses were commercial kiln operators. One

lumber seasoning course of a week's duration was conducted in February, 1950, and was attended by representatives of industry from Nova Scotia to Alberta.

Experimental piles of 2-inch white pine lumber, some untreated and some treated with sodium chloride and crystal urea, were erected in a commercial lumber yard to determine the effect of various methods of piling and treatment on the formation of yard brown-stain in the heartwood.

Weekly determinations were made of the moisture contents of uncoated samples of several species of wood exposed to a normal range of temperature and humidity in the Ottawa Laboratory. Tests are being continued to establish the equilibrium moisture content of these species under such conditions.

Secondary Wood-Using Industries

A new unit was organized in January, 1950, and was designated "Manufacturing in the Secondary Wood-Using Industries". Production methods in the furniture and other industries using lumber or some manufactured form of wood, rather than logs, as raw material will be studied. A project working plan has been prepared, outlining techniques for the measurement of wood waste, and field work is being planned for the summer of 1950.

A large number of requests for technical information were received in the wood utilization section. In the logging, milling, and secondary wood-using industries units, inquiries had reference chiefly to industrial uses of wood, manufacturing problems generally, and wood waste. The principal problems dealt with in the lumber seasoning unit had to do with dry-kiln schedules, types of dry-kilns, identification and correction of seasoning defects, and the seasoning of specialty products.

Wood Technology

Variations in significant technical properties between different specimens of the same kind of wood are often extremely wide. Special studies of the range and causes of such variations have been made, partly to facilitate recognition of the best type of wood and partly with a view to encouraging production of the most desirable types for each species. The studies were extended this year to balsam fir and black spruce from Newfoundland, where these species constitute the most important pulpwoods. Wood for observation and test was obtained from some 300 trees in a wide range of age classes on the most important site-types in the neighbourhood of Corner Brook and Grand Falls. This material was brought to Ottawa for stem analysis and measurement of the basic density of wood.

The balsam fir of Newfoundland appears of exceptionally good quality and freer from decay than the general run of this species in many districts elsewhere in Eastern Canada. Preliminary tests also suggest that wood of the Newfoundland balsam fir may be of slightly higher basic density than wood of this species from the mainland previously tested in a similar investigation. The work of recording data on rate of growth and basic density of this wood is undertaken with the object of supplying information that will show the potential pulp-producing properties of wood from stands of different rate of growth, age class, and site-type.

Other studies of variation included a series of tests made in co-operation with the woodlands department of a paper company in Ontario to determine the weight per unit volume of wood of both coniferous and broad-leaved species felled in different months over a 12-month period. From this study on weight of wood, and from other studies recording the decline in buoyancy of floating logs, articles are being prepared on the factors that affect the rate of sinkage of floating logs, a subject of considerable importance in transportation of pulpwood. A preliminary report was prepared for distribution to members of the Woodlands Section, Canadian Pulp and Paper Association, describing the relation of the amount of sapwood to floatability and methods of distinguishing sapwood from heartwood.

The study of the effect of applying chemicals to trees, both to facilitate removal of bark and to increase buoyancy by reducing the weight of the wood, was continued in the laboratory, and data for the large-scale study carried on in Ontario north of Lake Superior were compiled. Interim reports prepared for distribution describe the effect of the treatment in facilitating removal of bark and in reducing weight. A final report on all phases of the investigation since 1942 is in preparation. A paper on this subject was delivered at the United Nations Scientific Conference on the Conservation and Utilization of Resources, at Lake Success, New York, in August, 1949.

Many industrial problems were investigated. These included identification and appraisal of wood material submitted, and the examination of chip materials that did not disintegrate properly in pulping processes. Undue deterioration of wooden articles after manufacture was investigated. Remedial suggestions in various instances included recommendations of better selection of material and employment of edge-grain material where the minimum dimensional change in finished articles was required.

Publications

Technical Reports

- Effect of Chemical Treatment of Trees on Ease of Peeling. D. C. McIntosh and J. D. Hale.
- Glued, Laminated Construction. D. E. Kennedy.
- Cat Faces and Their Effect on the Strength of Telephone Poles. D. E. Kennedy.
- Transpiration Experiments on Trees Felled and Left with Foliage Intact. D. C. McIntosh.
- Air-Seasoning of Lumber. R. S. Millett.
- Stresses in Wood and Their Determination. R. S. Millett.
- Wood-Block Soil Method of Accelerated Testing of Wood Preservatives. H. P. Sedziak.
- Drying Schedules for Different Species. R. S. Millett and A. G. Glennie.
- Treatment of Trees with Chemicals. D. C. McIntosh.
- Moisture Content Determination and the Use of Sample Boards in Kiln-drying. R. S. Millett.
- Manufacture of Veneer and Plywood (French Ed.) W. E. Wakefield.
- Piling Lumber for Kiln-drying and Its Care After Drying. R. S. Millett.
- Accelerated Testing of Wood Preservatives. H. P. Sedziak.
- General Information on Wood Paints and Coatings. R. C. Hubbard.
- Interim Report on the Dielectric Properties of Wood. R. W. Peterson.
- Review of Literature on Decay in Pulpwood, its Measurement and its Effect on Wood Properties and Pulp Quality. D. W. Glennie and H. Schwartz.
- The Manufacture of Wall Board from Wood Waste. F. Bender.
- Factors that Affect the Buoyancy of Pulpwood Logs. J. D. Hale.

Reprints of Papers

- Waste Wood in the Forest Industry. T. A. McElhanney.
 The Lumber Problem—Discussion Concerning the Effect of a Bull-edger on Lumber Recovery, Also the Effect on Sawing Time. G. E. Bell.
 The Chemical Utilization of Wood and Wood Waste. H. Schwartz.
 Canadian Wood Bark as a Source of Tannin. C. Greaves.
 Treatment of Trees with Toxic Chemicals to Facilitate Removal of Bark and to Reduce Weight. J. D. Hale and D. C. McIntosh.

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Technical Papers

- Some Problems in the Design and Performance of Laminated Trusses. D. E. Kennedy. Delivered before the Forest Products Research Society Meeting at Grand Rapids, Michigan.
 Dry-formed Boards with Resins and Other Materials. F. Bender. Delivered before the Forest Products Research Society Meeting at Grand Rapids, Michigan.
 Wood Preservation, J. F. Harkom, presented by C. Greaves, and Treatment of Trees with Toxic Chemicals, J. D. Hale and D. C. McIntosh, presented by J. D. Hale, before Forest Section Meetings, U.N.S.C.C.U.R., New York.
 International Standardization Methods of Testing Wood. W. E. Wakefield. Presented before Annual Meeting, A.S.T.M. Committee D-7 on Wood, San Francisco, U.S.A.
 Calcium Removal from Sulphite Waste Liquor by Electrolysis. F. Bender. Presented before Technical Section Meeting, C.P.P.A., Montreal, Quebec.

Vancouver Laboratory

The high tempo of activity noted in recent years has continued. Adjustments of accommodation and personnel have facilitated the work of the various sections, while additional technical equipment—some of it designed, fabricated, and assembled by staff personnel—has permitted improved technique in detailed research.

Project work continued as the principal activity of the research staff. Technical reports were prepared from data secured through laboratory and field investigations. Furnishing technical information to industry has been an important phase of laboratory service. More than a thousand problems were submitted by industry during the year; in many cases these necessitated minor studies, while in some instances these investigations assumed the importance of project work.

Close co-operation was maintained with other research organizations and with all units of the forest products industry. Requests for assistance from industrial establishments showed a steady increase, and distribution of reports and technical data has grown in volume.

Members of the staff attended a number of conferences and association meetings, and several technical addresses were prepared for delivery before technical organizations. A number of articles, prepared by officers of the laboratory, appeared in various publications.

Timber Mechanics Section

In the study of the mechanical and physical properties of western Canadian woods, testing was completed on one shipment of virgin-growth Douglas fir in green condition from the Quesnel area, and on air-dried material from one shipment of mountain hemlock. Tree and shipment summary sheets for amabilis fir, second-growth Douglas fir, virgin-growth Douglas fir, and mountain hemlock were completed.

Numerous tests of adhesives, to determine their ability to meet the requirements of R.C.A.F. aeronautical specifications, were made at the request of industry. Weatherometer tests to determine the bond strength of plywood sections formed an important part of this work.

Studies were carried out to determine the comparative resistance to withdrawal of uncoated and coated shingle nails from various types of exterior wood sheathing on frame walls. Species tested included western red cedar, Douglas fir, western hemlock, true fir, and Sitka spruce, as well as several thicknesses of plywood, wallboard, and gyproc. Use of special air-cell equipment made it possible to measure loads in the low range with very great accuracy.

Tests on full-size members are frequently necessary to confirm the theoretical findings from laboratory research. To this end, 100 full-size telephone poles of both Douglas fir (mountain type) and western hemlock were stored at the laboratory for seasoning prior to testing. One-half of each group was given creosote treatment. All poles are being butt-soaked to simulate service conditions. The results from these tests will determine the effect of preservative treatment upon the strength of the wood.

Poles from the above study have also been used to secure information required in two other studies. Measurements have been taken of the change in circumferential measurements of poles during seasoning and after creosote treatment. Measurements of the taper in poles have also been taken to augment the record of similar measurements made on other available material, and from which the effect of variable taper upon the wood volume can be determined. The results already obtained indicate that both investigations will provide valuable information for the interpretation of pole and piling specifications.

Efforts to provide a satisfactory outlet for veneer log cores have led to investigation of their value for railway ties. Tests have been carried out to provide data as to the spike-retention power and the comparative strength in compression perpendicular to the grain for both untreated and creosote-treated ties from veneer log cores (which retain the pith) and the usual square-sawn product.

The increasing use of wallboards and plywood panels in house construction makes it essential to have accurate data upon the strength and deflection of different types of wall sections within the requirements of housing specifications. Racking tests on full-size panels, which will provide much valuable information on this important subject, have been made.

The unequal distribution of moisture is responsible for many difficulties in the use of plywood. Examination of finished panels and of small sections cut to stock size, made at manufacturing plants and furniture factories, showed a wide range in moisture content and has stressed the need for exhaustive study to determine the equilibrium moisture content of the glues used with veneers of different species. A great many samples of both Douglas fir and black cottonwood have been examined and a large humidity chamber has been installed to facilitate the investigation.

In addition to standard project work, a great many special problems were dealt with, ranging from tests of mechanical and physical properties of wood sections to the construction of two Quonset-type wood panel huts. This latter study is being carried out on a co-operative basis with the British Columbia Lumber Manufacturers' Association. A total of 425 special tests of mechanical properties and of nearly 5,000 tests of physical properties were made, while more than 400 custom tests were carried out on materials other than wood.

Wood Utilization Section

A survey of waste, carried out at three coast sawmills cutting western hemlock, showed a volume of sawdust proportionate to that noted in earlier studies, but there was a greater volume of slabwood and edgings, which may be attributed in part to heavier slabbing because of the profitable outlet for this material as pulpwood. One mill, using a round log gang-saw, produced the lowest volume of sawdust and only a small amount of solid waste, since most of the slabs were sent through an edger for additional lumber recovery.

Studies of the effect of lumber manufacturing methods upon the recovery of lumber from western red cedar and western hemlock logs were carried out at coast sawmills. From these studies a comparison of the grade recovery from second-growth and small old-growth (suppressed trees, tops, etc.) western hemlock was made. The results showed a higher grade recovery from second-growth logs, with a pronounced increase in value. In connection with these studies, a co-operative investigation was carried out with officers of the Entomology Section of the Department of Agriculture, to determine the de-grade resulting from attack by ambrosia beetles on western hemlock. The greatest de-grade, 28.3 per cent, was found to occur in the B and Better grade, but all grades were affected to some extent.

A survey of the production and use of red alder in British Columbia was made, and a great deal of valuable information regarding this important western hardwood was obtained.

Consolidated figures of logging waste from seven typical high-lead logging operations show that an average of 2,932 cubic feet per acre of material 6 inches and over in top diameter and 10 feet and over in length was left on the ground as waste. Results indicate percentage waste volumes, in terms of the original stand, as: Douglas fir 11 per cent, western red cedar 32 per cent, western hemlock 28 per cent, and balsam 29 per cent.

The effect of breakage in timber during logging is important, since the greatest loss usually occurs in the butt of the tree, which is the most valuable section. A report from one study showed that the greatest losses may be expected with western red cedar. Total losses, due to both defect and breakage, of 35 per cent of the gross tree volume were noted; of this, 15.8 per cent was due to breakage. Twenty-one per cent of the loss occurred in the butt portion.

Time studies were carried out on a high-lead logging operation. Results indicated that the cost in time for loading a turn of logs with 200 feet board measure was eight times as much per thousand feet board measure as for a turn of 2,500 feet board measure. Turns under 600 feet board measure showed a sharp rise in the time curve. The time per thousand feet board measure showed an increase from 10 to 40 per cent when the yarding distance was increased from 400 to 500 feet.

A study of the comparative rates of moisture absorption of kiln-dried and air-dried western red cedar was carried out. This indicated much less fluctuation in kiln-dried material. The effect of a moisture repellent upon the rate of absorption of moisture and resulting change in dimensions was studied; oak flooring strips were used for the study. The results indicated slightly less swelling with dipped material, but the difference was considered insufficient to justify use of any of the repellents studied.

Several runs were carried out in both the small unit and the full-size experimental dry kilns to establish satisfactory drying schedules for lumber of various dimensions and of different species. Douglas fir 4 inches by 4 inches was dried without de-grade after a preliminary treatment with urea and starch, while a schedule was determined by which 3-inch broadleaf maple may be dried successfully to about 11 per cent moisture content. Four charges of red alder paper roll ends were dried to develop a drying rate which would avoid checking and distortion of these small units. A preliminary run was made to investigate the possibility of economical kiln drying for 4 inches by 7 inches western red cedar. There was a marked increase in service to industry and in visits to sawmills operating dry kilns.

The effect of temperature on the shrinkage of wood during kiln drying was examined. Matched Douglas fir sections were dried at temperatures of 200°, 165°, and 120°F. The results indicate a negligible difference at the same humidity, but that a relatively high humidity resulted in a greater shrinkage than did a low humidity.

Assistance was again extended to the Forest Service of British Columbia in the preparation, calibration, and drying of forest fire hazard sticks.

The annual kiln-drying course was limited to operators and assistants who had not previously attended the classes, and attracted an attendance of 21 men from industry.

Wood Preservation and Pathology Section

Equipment has been designed to prevent surging and freezing of the lines during the boiling under vacuum conditioning of green timber in a treating cylinder. Tests have demonstrated that the type of control developed at the laboratory can be maintained in a commercial retort containing wood, creosote, and water.

Exploratory work carried out to determine the probable cause of the peculiar resistance offered by mountain-type Douglas fir to penetration by creosote has shown that some emulsions containing creosote, water, and petroleum can be very tough and stable at ordinary temperatures and might prevent penetration of the creosote. As a result of a large number of tests to determine the physical constants of wood-preserving oils and emulsions, a formula has been worked out to express the relation between temperature, concentration of preservative, and viscosity. A mathematical relation between the size of the pores in wood and the resisting pressure has been calculated, and the effect of different wetting agents upon a preservative has been examined as a preliminary to testing of the wood.

Lodgepole pine telephone poles, butt-treated with creosote, were placed in service lines by Alberta Government Telephones and the Calgary Power Company. A study of their durability has begun, under the direction of the Calgary District Office of the Forestry Branch. Information on treating solutions was supplied by the laboratory and two borings in each pole are being examined to determine the depth of penetration of the preservative.

Inspections of durability installations in Western Canada were carried out as part of a co-operative project with the Ottawa Laboratory to record the service life of Canadian woods under conditions favouring decay or attack by insects or marine borers. Examinations of decay in buildings or other structures were carried out in an effort to find the cause of the trouble and to determine corrective measures.

Many wood and fuel samples were submitted to the laboratory for identification, and sections of western red cedar showing evidence of collapse were examined to determine whether inherent structural characteristics were a factor in the trouble. Permanent mounts of 20 South American timber species were added to the laboratory collection.

Inquiries requesting identification of the causal organisms of decay or stain in wood samples were dealt with; they concerned shingles from South Africa; stained timber from Yoho National Park; heart-rot in lodgepole pine from Alberta. Cultures from infected lodgepole pine ties from Prince George have established the relationship between the infecting organism causing red stain in jack pine and that in lodgepole pine. Some 150 cultures of wood-inhabiting fungi and fruiting bodies, collected from logging debris studied under another project, were examined and identified. Several of these were added to the laboratory reference collection.

A great deal of attention was given to the problem of sap stain and mould on coast lumber species and on species used in the southern interior fruit-growing industry. Five additional proprietary dips were used with Douglas fir, western hemlock, and western white pine in the coast study, while some 10 dips were used on ponderosa pine, western larch, Engelmann spruce, and lodgepole pine box shooks. The chemical for use with fruit boxes must be non-poisonous; some of those tested gave definite promise of favourable results, and a comparison of their relative efficacy is

being drawn up. In connection with these studies, accelerated tests were carried out on new preventives, using western white pine test strips to determine their efficacy and suitable concentrations for use.

An investigation to study the deterioration of logging debris in the coastal region of British Columbia in relation to its use for pulpwood was undertaken. Thirteen sample plots in a western hemlock-balsam stand freshly logged, and 10 plots where the debris had remained undisturbed for from one to six years were examined closely for decay. Decay organisms and fruiting bodies were collected for systematic identification of the wood-destroying fungi. Compilation of the field data has been completed. Further examination will be made of tested areas at repeated intervals to determine changes in condition of the logging residue.

Wood Chemistry Section

Intensive investigations were carried out to determine the value of bark from western woods as a source of tannin. Samples, representative of a number of different log booms, of salt-water-floated western hemlock bark were selected at the hydraulic barker. From these samples tannin analyses and salt content determinations were made and related to the boom histories. Highly satisfactory results were obtained from the tannin extraction and a successful process was developed for the removal of almost all the salt content by ion exchange. The resulting extract was suitable for tanning sole leather.

Analyses were also run on Douglas fir bark from trees about 50 years old, just before and after the sap began to run. The results showed a substantial increase in the tannin content for the latter condition. This material was secured from the same area from which eight cords of bark were collected for shipment to a tannery at Kitchener, Ontario, for full-scale tests of its value for tanning purposes.

Tannin from salt-water-floated bark, without salt removal, was submitted to a drilling company for test of its possibilities for drilling mud in the oil well industry. Early results indicate that it is as effective as the imported tannin product as a viscosity reducing agent.

Initial analytical studies have been undertaken to establish the chemistry of western red cedar, both in the sapwood and the heartwood. Examination of material from the butt, mid-section, and top of a large cedar tree shows that the heartwood extractives decrease considerably from the butt to the top; study of the extractives is now in progress.

Analysis carried out on the brown cubical butt rot of western red cedar indicated that action of the decaying pathogen had almost entirely destroyed the wood cellulose, leaving lignin in a highly soluble condition. Preliminary investigations, in co-operation with the Timber Mechanics Section, indicate that finely ground cedar butt rot and well rotted peat moss might be used as extenders for phenol-formaldehyde resins in plywood manufacture.

Publications

Three numbers of the laboratory News Letter were issued.

Wood Waste as a Source of Pulp on the Pacific Coast. Mimeo. V-1005.

The Utilization of Sawmill Waste for Pulpwood. Mimeo. V-1006.

Sap Stain and Mould Prevention—The Relative Efficacy of Certain Chemicals. Mimeo. V-1007.

- A Method to Control Boiling under Vacuum in Wood Preservation. Mimeo. V-1008.
- Utilization of Sawmill Waste in the Southern Coast Region of British Columbia. Mimeo.
- The Physical and Mechanical Properties of Second-growth Douglas Fir. Paper presented before the National Convention of the American Society for Testing Materials, at San Francisco, California.
- Lumber Recovery from Douglas Fir Logs in British Columbia. Paper presented before the Third Annual National Meeting of the Forest Products Research Society.
- Toxicity Tests of the Wood Preservative Copper Naphthenate. A report for limited distribution only.
- The Absorption of Moisture by Kiln-dried Western Cottonwood as Compared with Matched Air-dried Material under British Columbia Coast Conditions. Progress Report on Project V-2.
- Wood Waste in the Douglas Fir Region. A paper prepared for the Annual Meeting of the Forest Products Research Society.
- Recent Advances in Chemical Utilization of Wood in the Pacific Northwest. Paper presented before the joint meeting of Puget Sound Section, American Chemical Society and Vancouver Section, Chemical Institute of Canada.
- The Oxidation of Waste Sulphite Liquor. Paper published in Pulp and Paper Magazine of Canada, August, 1949.

Pulp and Paper Research Institute of Canada

The Pulp and Paper Research Institute of Canada has been operated as a joint enterprise by the Federal Government, the Canadian Pulp and Paper Association, and McGill University. The work of the institute has been under the supervision of a General Director, responsible to a Joint Administrative Committee consisting of representatives of the three constituent bodies.

Fundamental Research Studies

In the study of the non-saponifiable constituents of a commercial sulphate talloil, a series of processes produced, among other substances, a sterol which differs from cholesterol only in the arrangement of certain atoms. Cholesterol is the starting material for the commercial syntheses of very valuable hormones.

Further work on the investigation of the chemical constitution of bark showed that sterols could be obtained from bark, and the principal sterol component was the one mentioned above which resembles cholesterol. These researches supported the possibility that waste barks might be made to yield a liquor fermentable to alcohol plus a residue for burning. Powdered bark was pyrolyzed by an inert preheated gas, and in preliminary experiments it yielded a charcoal of high ash content, volatile tars, and combustible gases.

Work on lignin showed that periodate lignin resembled lignin *in situ* physically as well as chemically in being a water-repellent substance, insoluble in all liquids which were tried, including caustic soda, but swelling in some organic liquids as well as in aqueous solutions of phenol or urea. On the other hand, ethanol lignin and other isolated lignins were soluble in alkali and some organic liquids. Results of some studies

showed that customary methods of isolation promoted inner condensations and cyclisations that formed new non-phenolic aromatic rings in some of the lignin molecules.

It is known that most isolated lignins differ from lignin *in situ* by being insoluble in a normal bisulphite cook. Periodate lignin, which dissolves normally, was previously found to be rendered insoluble by pre-treatments with acids and alkalis. Work is continuing to determine under what conditions the change toward insolubility occurs. Previous work on the behaviour of vanillin, pyrogallol, and related phenolic substances toward hypochlorite, hypiodite, sodium chlorite, and chlorine dioxide showed that these substances and oxidants had their own characteristics and were not analogous. Based on information arising from this work, a study of the action of sodium chlorite on spruce periodate lignin was begun. Three oxylignins which differed in relative amounts with the experimental conditions were obtained; these were closely examined. Spruce periodate lignin was also subjected to oxidation with alkaline hypiodite and hypochlorite under different conditions of hydrogen ion concentration, and the action and results were studied.

Some further work was done on the chemistry of vanillin. The commercial production of vanillin from lignin wastes is still limited by lack of large-scale outlets.

In the carbohydrate field, a study of the effect that wetting and drying cycles had on the behaviour of cotton linters toward a standard nitration was completed. This showed that a close control of the moisture history of pulps destined for chemical processing is needed. The work was continued with special emphasis on the measurement of the physical changes occasioned by variations in the technique of swelling and drying cellulose. The most interesting result was that cotton linters and purified wood-pulp attained the same maximum accessibility toward chromium trioxide when mercerized with caustic soda and recovered by washing with water at 0°C. It was found that solvent-exchange from water to benzene caused little, if any, decrease in accessibility, but that drying, even from benzene, was highly deleterious.

In order to avoid the complications caused by the comparative inaccessibility of cellulose toward most oxidants, a homogeneous paste of purified wheat starch was chosen for a study of the oxidizing action of hypochlorous acid. The amount of oxidation in the best preparations was found to account for about 70 per cent of the hypochlorite consumed, or for more than twice as much as is claimed in the literature. A supply of this oxidized starch is being accumulated, with the object of locating the exact positions of the carbonyl and carboxyl groups in the glucose units.

The work on the preparation, properties, and polymerization of cellulose acetate—crotonates was completed after it became possible to prepare satisfactory and soluble products by esterifying cotton linters or refined wood-pulp with acetic anhydride—crotonic anhydride mixtures in the presence of magnesium perchlorate and chloroacetic acid, and to estimate crotonoyl and polymerized crotonoyl groups in the products without difficulty.

In another research on cross-linking, a special "cellulose dinitrate", which was chosen for its unusual stability toward alkaline reagents, was synthesized. When dissolved in liquid ammonia containing sodium acetylide, about half the nitrate ester groups were replaced by the acetylene

radical. Analysis showed that one nitrate group had obviously been removed. The product was insoluble in all organic liquids tried, but swelled slightly in liquid ammonia and dissolved in 10 per cent caustic soda.

Applied Research Studies

The development and application of the optical scanning method of measuring the flocculation of pulp suspensions was advanced. The electronic discrimination and counting circuits were modified to give improved performance. Low shear rates and increase in fibre length were found to increase the flocculation markedly. Additives generally produced relatively small changes. The dimensions of the present equipment have limited the studies to very short fibres. New equipment is being made to allow whole pulp suspensions to be studied by a different technique.

The study of the formation quality of paper by a speed scanning technique, in which the fluctuations in optical transmission coefficient are recorded on a chart and analysed, were completed. An exhaustive study of the statistical nature of the fluctuations revealed that a simple statistical index could be used to describe the uniformity of the paper. A formation tester was constructed and is being used for a basic study of the effect of flocculation in pulp suspension on the formation characteristics of the resulting paper.

The permeability method of measuring the specific surface of cellulose fibres in the presence of liquids was found to be capable of measuring the degree of dimensional swelling of fibres. Swelling induced by the beating process appears to be an important factor in the development of paper strength. The experimental method was not entirely satisfactory, owing to a decrease of permeability with time. Attention is being given to this peculiarity, with a view to its elimination, and is meeting with some success.

A careful study of the stream-current and stream-potential technique led to a simple experimental technique in which zeta-potential, degree of swelling, and specific surface can be measured simultaneously. It was found that the conventional electrokinetic theory does not apply to cellulose, and that the electrical resistance of pads of swollen cellulose shows a marked decrease over a frequency range of 0 to 100 cycles per second. All these phenomena may provide means for studying those molecules of cellulose which are presumably involved in fibre bonding in paper.

The permeability of cellophane to water vapour, methanol vapour, and benzene was measured under various conditions. The results showed that the permeating vapour is sorbed by the cellulose, and the permeability coefficient is closely related to the amount of vapour sorbed.

The flow of liquid water through normally water-swollen cellophane was shown to be viscous. With organic liquids such as alcohols, benzene, and alcohol-benzene mixtures, cellophane develops an anomalous increase in permeability with temperature which is most pronounced at low degrees of swelling and cannot be explained by viscosity changes alone.

Two steel wheels, with widely different circumferential grinding surfaces, were used to study the fundamental nature of the action which occurs when wood is ground into pulp. The data secured were not suffi-

ciently informative, so other wheels carrying surfaces of intermediate character must be obtained. These wheels are being prepared in the machine shop of the institute with machine tools recently acquired.

A new chemical pulping plant, a titration laboratory, and a testing laboratory were completed and put into operation. The installation proved to be satisfactory for the study of the sulphite process. Much work was done on a modification of this process which has been developed at the institute. The planned study of the sulphate process will be undertaken when a steam compressor, acquired but not yet installed, provides steam at a higher temperature than can be obtained at present.

A short study of the effect of calendering on the printing behaviour of newsprint was carried out with the co-operation of the paper mill staff. A series of papers in which the calendering was gradually increased while all other variables were held substantially constant was made on the paper machine. The smoothness of the sheet increased and the bulk decreased as calendering increased. Ink penetration tests showed a poor relationship with calendering, but oil resistance corrected for caliper showed a good correlation, increasing with calendering. Proof-press printing tests showed that printing quality increased with calendering, rapidly at first but at a continually decreasing rate.

Suitable gloss standards were developed for checking the calibration of the instrument used for testing the surface oil resistance of paperboards. The standard oil provided for use in this test was checked from time to time for stability of its viscosity properties.

Work was continued in seeking new or improved laboratory methods of isolating components of sulphite waste liquor, from which more may be learned about the composition of typical liquors and the properties of the organic compounds present. A method, devised at the institute, of isolating a sugar fraction by resinous ion exchangers was improved considerably. Application of the method to a fermented liquor yielded a small quantity of crystalline xylose.

Attempts were made to improve a complicated electrophoretic method of separating electrolytes from sugars and other substances in sulphite waste liquor. The method proved that some of the copper-reducing components of the liquor are electrolytes and not sugars.

A technique developed recently in England for identifying simple sugars in sugar mixtures by paper partition chromatography was found to be directly applicable to waste liquors even without preliminary purification. This technique is for the identification of very small quantities of sugars. An extension of the process is under study.

The test of pulp which gives the Roe chlorine number is known to suffer from several sources of error. A new form of apparatus was devised in which steps were taken to reduce or remove the sources of error. The results showed that the reproducibility of tests was improved and the chlorine number of mixtures of two pulps was very nearly a linear function of the composition of the mixture.

Another test of pulp in which potassium permanganate is used, giving the permanganate number, was investigated to find what relationship existed between it and the chlorine number. The results, when compared with theoretical predictions, enabled useful conclusions to be drawn.

More tests of a method, developed at the institute, for determining unbleached sulphite pulp in newsprint were made. Results were closely reproducible, but the test is still time-consuming.

An amended procedure for testing the bursting strength of paper by means of the Mullen tester was discussed with representatives of interested organizations. Extended trials are being conducted to ensure that the proposed amended procedure will lead to the accuracy sought. The dynamic deadweight device for calibrating gauges under the loading conditions to which they are subjected in the testing of paper was satisfactorily completed. Dynamic calibrations of gauges are now being offered as a service to Canadian mills.

Work on the electronic dirt counter, for assessing the amount of dirt in a sample of paper, culminated in the first commercial unit. Preliminary tests indicate that it is very satisfactory. Primary and secondary standards for calibrating and checking these instruments were designed and tested with varying success. The results given by the instrument were found to agree well with the known amounts of dirt in prepared sheets containing carbon black, and also conformed well to statistical analysis.

The study of the construction and maintenance of forest truck roads was completed, and a book on the subject was published. It deals with pertinent economic factors, road standards and location, road materials, road construction and maintenance, road equipment, machinery, and production data.

Through the co-operation of some paper companies and equipment manufacturers, good progress was made in developing practical equipment and operational procedures for commercial application of a system of bringing wood down steep slopes on a suspended wire by gravity.

Through additional laboratory and field work, the study of the application of strain gauges in woods operations was brought to a stage where companies themselves could use the recommended means which were developed in connection with booms in holding grounds, pulpwood towing, and mechanical loading.

The field work on choice and arrangement of pulpwood landings and on ways and means of economical handling of wood at these transfer points was completed.

Scattered information on research already conducted on the floatability of pulpwood and sinkage losses was assembled for analysis and summarizing so as to facilitate its use and provide a guide for future studies by interested organizations.

A study to determine under what conditions the cutting methods used by the industry are most satisfactory from the viewpoint of forest management was completed.

Assistance was given to several companies in planning their silvicultural studies and in making certain silvicultural experiments on their limits.

In the matter of planning woods operations with regard to seasonal conditions, techniques, greater permanency of woods labour, and more continuous use of forest areas, analysis of typical operating practices from various aspects was made, and information which should be of benefit to the industry in its planning of forest management was provided.

Trials of a portable chipper were conducted on a woodlot and on one mill's limits in chipping slash and slabs for pulp, compost preparation, and other purposes. Pulping and physical tests were conducted at the institute with promising results.

Special Projects Branch

J. M. Wardle, Director

The year under review was marked by developments of major importance to the work of this branch. On January 18, 1950, a re-alignment of departmental responsibilities resulted in the transfer to this branch of the Public Projects Branch from the former Department of Reconstruction and Supply. The re-organization also resulted in placing with the branch, responsibility for the administration of the Trans-Canada Highway Act.

As a result of survey work and inter-governmental negotiations, the establishment of the Trans-Canada Highway moved much nearer actual accomplishment. Designed primarily to provide a main artery of commerce, uniform in design and quality of construction across all ten provinces, such a road link would also be an important factor in Canada's defence arrangements. By encouraging tourist traffic between provinces and also by encouraging the tourist industry generally, it is hoped that the highway will contribute substantially to better national and international understanding and co-operation.

Federal Projects

To meet the growing power needs of the important Keno Hill mining district in the Yukon and to encourage further exploration and development of mineral claims in the area, surveys were carried out in the summer to determine the most suitable site for hydro-electric power development on the Mayo River.

A number of sites were checked and as the result of these investigations two possible locations were proposed. Both involved storage on Mayo Lake. In one development the main dam and plant would be at the outlet of Mayo Lake and in the other, a storage dam only would be in this location with the main dam and plant on the Mayo River about five miles above the town of Mayo.

The second proposal had the most desirable features and the estimated potential capacity of this development would be 8,000 horse-power, with an initial installed capacity of 3,000 horse-power to meet present load requirements. The estimated cost of developing this 3,000 horse-power is \$3,000,000, which cost includes basic provision for an ultimate development of 8,000 horse-power at the same site.

In connection with modifications and revisions of the Rideau Canal Bridge, Ottawa, officials and engineers of the branch advised with committees representing the Federal District Commission and the City of Ottawa, and prepared final plans on which tenders could be called. An award of the contract is expected to be made early in the next fiscal year.

Trans-Canada Highway Division

Considerable progress was made toward the establishment of a national hard-surfaced highway. Following the Federal-Provincial Conference on the subject in December, 1948, the Special Projects Branch continued to assemble essential facts and figures to provide a basis on which the Federal Government could estimate its contribution to the cost

of constructing a Trans-Canada Highway. These facts and figures also provide a basis for timing the project to fit in with the over-all employment picture and the availability of materials.

Following discussions and exchanges of views between the Federal and provincial Governments the Trans-Canada Highway Act was passed by Parliament and became effective on December 9, 1949. Under the terms of this Act the Federal Government was empowered to enter into agreements with the provinces to provide one-half the total estimated cost of constructing the highway according to approved specifications, up to a maximum contribution of \$150,000,000. Work on the project must be completed by December 9, 1956, as the Federal Government, under the terms of the Act, cannot contribute in connection with work done after that date.

Shortly after the Bill was passed, another Trans-Canada Highway Conference was held at which technical and other discussions took place between Federal and provincial representatives. Much attention was given to the standards to which the highway would be constructed including widths, grades, and limiting curvature. Carrying capacity of bridges and of the highway surface were agreed upon.

A major portion of the engineering staff's time and effort was concentrated during 1949 on study and preparation of data for these technical discussions. As a result of this and other conferences, and in recognition of the fact that highway construction and maintenance is a provincial right and responsibility, a draft agreement was drawn up and submitted to the various provincial authorities on March 1, 1950.

Officers of the branch participated in conferences at the technical level with representatives of the various provinces respecting a number of technical features of the portions of the national highway to be established in their respective provinces.

Northwest Territories Power Commission

This Commission was established by statute in 1948 to construct and operate electric power plants in the Northwest Territories to assist the mining industry and the development of the Territories generally.

Snare River Power Development

Among the responsibilities of the Commission is the operation and maintenance of the Snare River water storage and power project which was completed in the autumn of 1948. The Commission constructed additional living quarters at the Snare River plant for operating personnel and began construction of a combination garage, office, and warehouse building. A transmission line connecting the Yellowknife terminal of the Commission's Snare River transmission line with the Consolidated Mining and Smelting Company's line adjacent to Yellowknife was completed. This arrangement enabled the Commission to deliver power to the Yellowknife Power Company for sale within the town limits. The plant was kept in continuous operation throughout the year.

Fort Smith Power Development

Good progress has been made in the construction of a plant to provide diesel-generated power at Fort Smith to supply electric power on a financially self-sustaining basis to the town of Fort Smith and to various

Federal Government establishments located there. The power plant building has been completed, all poles procured, and a portion of the distribution system constructed. Generating equipment is to be delivered on the opening of navigation on the Slave River. It is hoped to have the plant in operation by the early autumn of 1950. The installed capacity will probably be 520 horse-power and the estimated cost of the project is \$125,000.

Hay River Power Development

The Commission investigated the power requirements of Hay River and decided to undertake construction of a diesel plant and distribution system to serve the needs of the community, including the requirements of various Federal Government departments at that point. The installed capacity will probably be 350 horse-power and the estimated cost of the project is \$150,000.

Full details of the operations of the Northwest Territories Power Commission will be found in its annual report for the year ended March 31, 1950.

Eastern Rockies Forest Conservation Board

The work of this board, initiated under the provisions of the Eastern Rocky Mountain Forest Conservation Act on April 1, 1948, achieved most satisfactory results. As, however, this work is covered in a separate report by the board, only a brief summary is given here.

The main emphasis continued to be on road development, particularly in the Bow River and Crowsnest Forests. Construction, chiefly by contract, of some 81 miles of trunk road (20-foot roadway) and 65 miles of secondary road (14-foot roadway) was completed. In conjunction with the road construction program two fully manned survey crews carried out a road location program that resulted in some 71 miles of located road being staked on the ground. Construction and survey work was carried on well into the winter season. Requirements for materials such as culverts and bridge timbers were determined, orders placed, and delivery secured to allow continuity of work during the season.

Subsidiary engineering work included the surveying of some 29 miles of boundary line in the Crowsnest Forest in the winter season. In addition good progress was made in providing improved living quarters for the ranger staff. Plans were also formulated to develop the radio communication system over the 8,585 square miles of the board's area.

Encouraging progress was made in carrying out a range and watershed management survey which will necessarily extend over several years. Included in such work are studies of matters related to forest and vegetal cover, meteorological conditions, detection of erosion, and grazing conditions as affecting both domestic stock and game. Work was also carried out in the field of fire detection including visibility mapping, lookout site selection, and determination of fire-hazard standards. In co-operation with the Forestry Branch of the Federal Government, good progress was achieved in developing forest-cover maps from aerial photographs, with further work continuing in this field.

Fire loss was somewhat greater than in the previous year with higher fire-fighting costs. A rather large proportion of the outbreaks was caused by lightning but aggressive fire-fighting minimized the loss.

Some slight revision in the board's area resulted in the inclusion of the Spray Lakes area of 21.2 square miles within which a power development program was initiated.

Close co-operation continued with the Federal and provincial authorities in matters of policy. The Alberta Forest Service carried out to the fullest extent its responsibilities in the field of forest protection and maintenance.

Calendar Year 1949

Canadian Government Travel Bureau

D. L. Dolan, Director

The dollar value of the tourist industry to Canada reached another high in 1949 of \$286,000,000. This is the fourth consecutive year since the war for new highs in this important industry—in dollar volume, in the number of people crossing the border, and in vehicle traffic.

The year started with an economic slump in the United States and this visibly affected tourist movements. Although conditions improved in the second half of the year, it was obvious that American visitors were shopping for their vacations more carefully.

The work of the bureau expanded considerably both as to the volume of inquiries dealt with and new activities in the promotional field.

Customs legislation in the United States extended exemption duty for their residents returning from Canada to \$200 for a stay of more than 48 hours once every 31 days. This is in addition to the \$300 former exemption for their residents who stay more than 12 days and which is allowable once every six months. This means if United States' residents stay in Canada more than 12 days they are allowed a total exemption of \$500.

Tourist expenditures in Canada since the war have grown from \$166,000,000 in 1945 to an all time high of \$286,000,000 in 1949. Prior to World War II the highest tourist expenditure in Canada was \$198,000,000 in 1929. Tourist expenditures from countries other than the United States have risen from \$3,000,000 in 1945 to \$18,000,000 in 1949, despite restrictions.

Information Division

Inquiries

With increased advertising, inquiries have grown from 42,679 in 1946 to 322,000 in 1949. More than 60,000 of these were passed this year to the provinces, transportation companies, and associations. Only those inquiries asking for specific information and where an immediate reply was not required were so distributed. Inquiries reached an all-time high of more than 6,000 in one day. Approximately 2,000,000 pieces of Canadian Government Travel Bureau literature and 138,000 pieces of federal and local literature were distributed in replying to inquiries.

Newsletter

Beginning in January 1949, the Canadian Government Travel Bureau launched the production of a *Travel Newsletter* designed especially for the travel editors of the principal United States newspapers and magazines. There were 19 releases of the newsletter and much of the material was reprinted in major media of information in both the United States and Canada. At least one travel magazine uses the newsletter as basic material

for a monthly Canadian column, while many other magazines and newspapers use the material at various times. The distribution is now more than 550, and a number of information and public relations organizations in Canada have been added to the United States outlets. Occasionally the newsletter plants the seed for editorial, radio, and motion picture treatment of Canadian travel themes.

Calendar of Events and Convention Lists

Starting this year six *Calendar of Events* and 24 *Convention Lists* were sent out. The former, listing of events of importance across Canada have been distributed to the same mailing lists as the *Travel Newsletter*, principally in the United States. Convention lists, for which there is chiefly a domestic demand, have been distributed to a smaller number of outlets.

Exhibition and Visual Aids Division

Sports and Travel Shows

Participation in sports and travel shows was confined to the middle and western states. Exhibits were placed in Chicago, Milwaukee, Minneapolis, Seattle, San Francisco, Los Angeles, and Dallas. There was a large attendance at all these shows and much interest evidenced in vacations in Canada.

The co-operation of the National Parks Service and the travel bureaus of Ontario, Manitoba, and British Columbia, in providing trained information personnel at various shows was of great assistance in answering the many detailed questions of prospective tourists.

Films in the United States

Field and Stream

In 1947 the bureau, through the National Film Board, placed four films on fishing with the *Field and Stream* library. This library was to have sole rights in the United States for the renting and sale of prints and, in return, was to publicize and service the films. To date six of these films are being distributed: *Great Northern Tacklebusters*, *Atlantic Salmon*, *Speckled Trout Across Canada*, *Indian Canoe Men*, *Canadian Smallmouth*, and *Cohoe Salmon on the Fly*.

Film Libraries

In 1948 a survey was made by the National Film Board of possible film libraries in the United States for distribution of Canadian travel films. The outlets include Canadian Government offices, public libraries, university extension libraries, and State Departments of Education in 39 states. To tie in with this, a pamphlet *Canadian Travel and Wildlife Films* was produced. This lists all the outlets in the United States and gives a summary of each of the 13 films.

During the year the 62 libraries loaned the films for 15,066 showings to a combined audience of 1,135,989, and the Chicago and New York National Film Board offices loaned the films for 2,455 showings to a combined audience of 345,944. This made a total of 17,521 showings to a total audience of 1,481,933.

Five other films used in television this year are in process of production for release to the libraries in 1950.

Television

In 1949 a start was made on loaning Canadian Government travel films for television in the United States. Five special television travel films were released in July. Altogether 15 films were televised in 16 cities in 11 states over 23 stations for a total of 125 showings. These films were: *Canadian Cruise*, *Famous Fish I Have Met*, *Road to Gaspé*, *Canoe Country*, and *Winter Carnival*. Four other films are in production by the National Film Board for release in 1950.

Educational Films in Canada

Following the resolution at the Third Dominion-Provincial Conference, *Welcome Neighbour* was approved by the Film Committee set up at that conference and was released by the National Film Board during Tourist Week to more than 500 theatres in Canada in the *Canada Carries On* series.

Still Pictures

During 1948 and 1949 the National Film Board was commissioned to secure pictures in every province of Canada and in the Northwest Territories in order to rejuvenate its still picture library. These are exclusive pictures used for magazine advertising, brochures, news releases, and free lance writers. A considerable number of pictures, both in Kodachrome and black and white, have been selected. Some of the provinces also have added to the picture library.

Publicity Division

Newspaper and Magazine Advertising

The bureau's advertising expenditure in United States magazines and newspapers has grown from \$28,180 in 1945 to \$824,362 in 1949. There were 97 insertions in 37 magazines of from one-half to full page of colour or black and white, and 580 insertions in 58 newspapers. Copies of all advertisements, with name of publication and date of insertion, were sent in advance to provinces and transportation companies for information and co-ordination.

Activities of the Director

The Director represented Canada at the Third Inter-American Travel Congress held in San Carlos de Bariloche, Argentina, in February. The aim of the congress was to bring about a freer exchange of travellers between South, Central, and North American areas. The United States, Canada, and some 20 Latin American countries were represented.

The Director, as an honorary member of the National Association of Travel Officials (United States), attended their annual meeting in Denver, October 24-27, and delivered one of the major addresses. He addressed several large meetings of hotel, convention, and tourist associations as well as the Canadian Consular Officers' meeting in Washington.

In Canada he addressed many of the hotel, convention, and tourist association annual meetings and conferences. He also spoke to many service clubs and industrial associations, as well as the Mid-Continent Council of Industrial Development Agencies at Winnipeg. In July the Director visited the Maritime Provinces and discussed with provincial officials and tourist bodies a proposed survey of tourist accommodation. Later, at the request of Ontario tourist officials, he inspected the tourist development in the Nipigon area.

Travel Schools Manual

Early in 1949 the Bureau undertook production of a *Travel Schools Manual*, basically a guide for community action on behalf of the tourist industry through organization of travel host-schools, similar to those conducted with success in a number of states in the United States. It outlines a procedure for forming travel schools which any Canadian community could adopt. It is hoped that the acceptance and approval of the travel school idea, which has come from many organizations and communities, will lead to the formation of such schools in many communities in Canada in the coming year. The manual was printed in both English and French and given wide distribution through provincial bureaus, chambers of commerce, and boards of trade, as well as tourist and other organizations.

Promotional

The Bureau sought the assistance of the various provincial tourist bureaus in order to obtain publicity material, particularly feature articles and pictures. Much of this material has been used for press releases and in the *Travel Newsletter*, which is distributed widely in the United States. With more material supplied by the provinces it would be possible to place much more Canadian travel publicity in effective United States media.

Booklets

A new *Vacations Unlimited* booklet is planned for distribution in 1951. The former booklet has been revised and, with a new cover, will be used in 1950. A reprint of *Rod and Reel* and a revised *Road Map* are now on order and will be delivered in February, 1950. This year the following informative pamphlets were issued: *Dude Ranches in Western Canada*, *Educational Summer Courses and Handicrafts, Bridges and Ferries on the International Boundary*, *Winter Sports and Skiing Accommodation in Canada*, *Steamship Schedules*, *Admission of Aircraft*, summary of *How to Enter Canada*, *Boy's and Girl's Camps in Canada*, *Gaspé Tours*, *Hunting and Angling Regulations*, and *Canadian Travel and Wildlife Films*.

New Posters

A series of four beautiful, coloured posters, 10 by 14½ inches—captioned enlargements of fish pictures in *Rod and Reel*—are on order. They will be placed with travel agencies, consulates, and motor leagues, mainly in the United States. The new posters are: Eastern Brook Trout, Smallmouth Bass, Muskellunge, and Tyee.

Conventions

The Travel Bureau co-operated with the executives of 44 international conventions. Of these conventions 27 were held in Canada and 17 in the United States.

Letters of welcome or invitation, general sets of literature, and, in some cases, tourist inquiry forms (a total of 79,000 publications) were sent to 24,000 individual delegates.

A total of 13,500 publications were sent in various quantities directly to a number of the conventions.

Follow-up for 1949

In November the Bureau sent "follow-ups" to a selected list of about half the Americans who inquired for information last year. Comments from these "follow-ups" were sent to provinces again this year. This "follow-up" provides much useful information about tourists as well as the names of a great number of their friends who are interested in vacationing in Canada. Literature is mailed to them along with an inquiry form for more detailed information.

Fourth Dominion-Provincial Tourist Conference

The Fourth Dominion-Provincial Tourist Conference, held in Ottawa, November 7, 8, and 9, 1949, reviewed the most successful tourist year in Canada's history and discussed broad plans for further advancement of the industry in 1950. Under the chairmanship of the Honourable Robert H. Winters, then Minister of Reconstruction and Supply, Ottawa, the conference agreed that 1950 would see intensive competition for the tourist dollar both in North America and in overseas countries, and recommended that the following steps be taken to maintain Canada's flourishing tourist industry: opening of Canadian Government ground-floor travel offices in New York, Chicago, and a suitable California city; organization of a mobile cooking school by the Canadian Government Travel Bureau to tour the provinces; the taking of a statistical survey of all types of Canadian tourist accommodation; integration of provincial grading systems for tourist facilities in order to secure uniform classification; and an intensive campaign to make Canada's historic sites better known. The conference condemned the use of discriminatory language in tourist literature.

Attending the conference were 34 official delegates from the Federal and provincial Governments and transportation companies, as well as 31 others closely connected with the tourist industry, who were there as advisers or observers.

Sixth U.S. Editors' Goodwill Tour

On June 20 the Canadian Government Travel Bureau was host to 22 American editors representing 12 states on an annual goodwill tour for 10 days around Ontario.

The Honourable Robert H. Winters presided and the Prime Minister, The Right Honourable Louis St. Laurent, gave an inspiring message. Parliament and the press were well represented.

The tour is sponsored by the Ontario Department of Travel and Publicity in conjunction with the Hotel Association of Ontario and the Ontario-Quebec Division of the Canadian Weekly Newspapers Association.

The Travel Bureau was also able to arrange a reception for the group at Government House and with the United States Ambassador.

Accommodation and Equipment

In the past two years accommodation has not only been trebled, but also redecorated and new lighting installed. A considerable quantity of the latest office and shipping equipment has been obtained to accommodate and assist the growing staff to take care of the greatly increased volume of work and new activities.