CANADA

DEPARTMENT OF MINES AND RESOURCES

REPORT

OF

Lands, Parks and Forests Branch

FOR THE

FISCAL YEAR ENDED MARCH 31, 1946

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LANDS, PARKS AND FORESTS BRANCH

R. A. GIBSON, DIRECTOR

During the past year much thought has been devoted to planning and organization. The ending of the war and the subsequent Dominion-Provincial conferences on reconstruction made it appear for some time that it would be possible for both Dominion and Provincial Governments, in collaboration with industry, to undertake immediately greater activities for the safeguarding, fuller development, and more complete utilization of the natural resources in which this Branch is particularly interested. While these hopes have not been fully realized, some increase in appropriation has been granted and it may be said that studies and discussions have made the relative responsibility clearer to all concerned.

Funds have been provided for basic surveys which are essential to sound budgeting. Steadily increasing interest in the Northwest Territories and Yukon has resulted in additional funds being made available to all government departments for scientific services in the northland. It has been possible to undertake desirable public works for the improvement of transportation in Mackenzie District. For the first time a substantial vote for the organization of a service to protect the forests and to initiate game management policies in Mackenzie District of the Northwest Territories has been obtained. A start has also been made with the organization of forest protection in Yukon Territory.

A more adequate staff has been provided for local government administration and for the administration of the resources of Mackenzie District. Mining activity in the Yellowknife district has greatly increased and the revenue from this source is growing. To meet the demand for more commercial and residential building sites, it was necessary to survey an additional townsite area at Yellowknife. Plans are now under way for its development, including the provision of modern water and sewer services. A modern airport is being constructed at Yellowknife, and one landing strip suitable for use by large aircraft has been completed already.

Plans have been drawn for the construction of new government buildings at Fort Smith, Yellowknife, and other places, which will house administrative and other personnel. These structures include an administrative building and staff quarters at Fort Smith; an administrative building, liquor dispensary, and staff quarters at Yellowknife, and a number of cabins for members of the warden service in Wood Buffalo Park. Arrangements are also under way for the erection of a modern hospital at Yellowknife, to the cost of which the Government is prepared to contribute one-third.

Mining activity in Mackenzie District has been particularly active in the Yellowknife area, where the production of gold was resumed at the Negus mine during the late summer of 1945. Development work was continued at other important properties where production was suspended temporarily, and their re-opening has been forecast for the coming year. Exploration and staking have been extended for a distance of 125 miles beyond the settlement of Yellowknife, and a number of important gold discoveries were reported during the year. The decision of the Dominion Government to develop hydro-electric power on the Snare River is expected to assist in the reduction of mining costs in the Yellowknife region, and stimulate the mining industry as a whole.

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The increased importance of radio-active minerals in the Great Bear Lake area, including uranium and radium-bearing ores, has led to an expanded program of exploration and geological mapping. The mine and mill of Eldorado Mining and Refining (1944) Limited at LaBine Point on Great Bear Lake continued to operate at capacity.

An important development during the year was the transfer to the Department of National Health and Welfare of the control and supervision of medical care and hospitalization of the native population of the Territories. For almost two decades the Northwest Territories Administration had extended medical service to the Eskimos of the Northwest Territories to the maximum extent possible within the limits of funds made available. Hospitals, owned and operated by church missions, were established at strategic points where native and indigent patients were admitted and maintained on a per diem basis by the Administration. Industrial homes were also operated in conjunction with some hospitals to care for convalescent or infirm patients. Medical kits and drugs were provided by the Administration at Arctic and other posts where there were no hospitals. Special medical surveys were made from time to time to investigate and alleviate diseases to which the native population is susceptible.

In Yukon Territory, mining continued to be the principal industry, and gold production from placer operations showed a substantial increase over the preceding year. The resumption of lode mining on a larger scale was forecast by the acquisition of claims in the Mayo District, formerly owned by Treadwell Yukon Corporation, by a newly incorporated company backed by eastern capital.

Arrangements were made prior to the end of the fiscal year for the taking over and maintenance of the Alaska Highway by the Department of National Defence (Army). This action will result in the resumption of administration of the natural resources along the route by the various services of this Branch.

In the development of the Yukon and Northwest Territories, it is desired to acknowledge the assistance which has been received from many other departments of the Dominion Government which also have responsibilities in providing essential public services.

The end of the war and the easing of travel restrictions has had an immediate effect on the number of visitors to the National Parks during the year under review. This increase amounted to nearly 25 per cent, and with the provision of additional tourist accommodation, the volume of travel may be expected to swell to much greater proportions.

It is planned to afford returned service personnel an opportunity to obtain concessions to provide accommodation for visitors, but there is little hope that the amount of building material available for the construction of necessary seasonal buildings will meet the demand. Consequently, a fuller use of campgrounds is being promoted, and returned service personnel concessionaires are being established on these camping areas to provide the amenities which campers usually require. The organization of community activities on campgrounds to promote recreation is also being arranged.

It is expected that alternative service workers who have been relied upon to perform a considerable amount of maintenance work in National Parks will be released, and returned men will be provided with an opportunity of obtaining employment at prevailing wage rates. Steps are being taken to replace as rapidly as possible worn-out and obsolete maintenance equipment.

During the year the Dominion's responsibility in forestry was outlined in the House of Commons by the Minister. The forest resources of Canada are immense in size and diversified in character. If Canadians are to reap the full value of this great national heritage, the forest lands of the nation must be

brought into a state of continuous production. Administration and protection of the Crown forests lying within provincial boundaries is, and will continue to be, a responsibility of the provincial authorities. The Dominion Government, however, can properly assist in the orderly development of national forest resources in two ways: first, by expanding activities for which it admits responsibility, and, second, by assisting, through the provision of funds, to raise provincial standards respecting the conservation, protection, and development of the provincial forest resources.

The Dominion Forest Service is already engaged in the broad fields of research in silviculture, forest protection, utilization of forest products, and forest economics, and has demonstrated the feasibility of ideas and the development of products which have since been adopted by industry to the benefit of all concerned. It is hoped to be able to expand activities of the Dominion Forest Service to the extent necessary for the post-war years.

The Branch welcomes the return to civil duty of a number of those who have been in the Armed Services or who have been seconded to war departments.

BUREAU OF NORTHWEST TERRITORIES AND YUKON AFFAIRS

NORTHWEST TERRITORIES

The Northwest Territories comprise that part of the mainland of Canada lying north of the Provinces of Manitoba, Saskatchewan, Alberta, and British Columbia and east of Yukon Territory, the islands in Hudson and James Bays and in Hudson Strait including Ungava Bay, and the vast Arctic Archipelago. The estimated total of land and fresh-water areas of the Northwest Territories is 1,309,682 square miles. According to the 1941 census, the population of the Territories was 12,028, including 2,284 whites, 4,334 Indians, 5,404 Eskimos, and 6 others, chiefly Asiatics. The total has since been increased by about 3,000 owing to increased mining activity in Mackenzie District.

The Commissioner of the Northwest Territories in Council has power to make ordinances for the government of the Northwest Territories in relation to such subjects as are designated by the Governor in Council under the authority of the Northwest Territories Act. The seat of government is in Ottawa.

Council

Commissioner	Charles Camsell,
Deputy Commissioner	R. A. Gibson,
Members of Council	A. L. Cumming, K. R. Daly, R. A. Hoey, S. T. Wood.
Secretary (Acting)	J. F. Doyle.

Work of Council

Five regular and seven special sessions of Council were held during the year. Assent was given to the following ordinances and amendments: Insane Persons Ordinance; Armed Forces Moratorium Ordinance; Local Administrative District Ordinance; Businesses, Callings, Trades and Occupations Licence Ordinance; Judicature Ordinance; Vital Statistics Ordinance; Local Administrative District Ordinance; Dog Ordinance and Regulations, Bulk Sales Ordinance and Assignment of Book Debts Ordinance.

In addition, matters of policy were discussed in connection with the Eastern Arctic Patrol; Eskimo affairs; medical services in the Eastern Arctic; health and welfare; education; hospital and medical services; Northwest Game Act and Regulations; establishment of forest and game protection service; assistance

to mining companies in the construction of trunk roads; radio services; supervision of payment of family allowances; public buildings; agricultural, fish, geological, water-power and hydrographic, geodetic, legal, forest and wild life surveys, and appointment of Territorial officers and commissioners.

R. A. Hoey, Director, Indian Affairs Branch, was appointed member of the Northwest Territories Council as of August 21, 1945, to replace Dr. H. W. McGill, who retired on superannuation March 21, 1945.

Major D. L. McKeand, Superintendent of the Eastern Arctic and Secretary of the Northwest Territories Council, retired from the Government service on superannuation as of June 13, 1945. The duties of Acting Superintendent of the Eastern Arctic were assumed by James G. Wright, and the duties of Secretary of the Council were carried on to the end of the fiscal year by John F. Doyle.

Administration

The Lands, Parks and Forests Branch is responsible for the administration of the various acts, ordinances and regulations pertaining to the Northwest Territories. To facilitate departmental administration there is a Superintendent for the Eastern Arctic and one for the Mackenzie District. A departmental agent is stationed at Fort Smith, N.W.T., and this officer is also Superintendent of Wood Buffalo National Park, Agent of Dominion Lands, Crown Timber Agent, Mining Recorder, Stipendiary Magistrate, and Marriage Commissioner. The Sheriff of the Northwest Territories is also stationed at Fort Smith. The Mining Recorder, Agent of Dominion Lands, and Crown Timber Agent for the Yellowknife Mining District, which includes what was formerly known as the Great Bear Lake Mining District, is stationed at Yellowknife. The Mining Recorder for unorganized districts is located at Ottawa, and Sub-Mining Recorders are also located at Ottawa, Edmonton, Fort Simpson, Fort Norman, Aklavik, Coppermine, and Port Radium.

Medical Officers

For a number of years the Northwest Territories have been divided into seven medical districts and two sub-districts, over which medical officers of the Department of Mines and Resources had jurisdiction. These officials had their headquarters at Fort Smith, Fort Resolution, Fort Simpson, Fort Norman, Aklavik, Port Radium, Yellowknife, Chesterfield, and Pangnirtung, and on the vessel carrying the annual Eastern Arctic Patrol. In addition, doctors were employed at various points throughout the Territories to look after the general health of those engaged in joint defence projects and in mining and other industries.

Under the provisions of Order in Council (P.C. 6495) of October 12, 1945, the control and supervision of that part of the public service administering the medical care and hospitalization of Indians, including Eskimos, together with the staff employed, equipment, and other physical assets used in connection therewith, were transferred from the Department of Mines and Resources to the Department of National Health and Welfare as from November 1, 1945.

As the Department of National Health and Welfare had made no financial provision for the medical services and hospitalization of Eskimos, all accounts were paid by the Northwest Territories Administration up to and including March 31, 1946.

Although the medical staff of the Department of Mines and Resources was absorbed by the Department of National Health and Welfare, the medical officers in the Territories continue to represent the Department of Mines and Resources in the administration of the Public Health and other related ordinances and also in connection with the health of all residents of the Territories other

than Indians and Eskimos. All doctors have been appointed coroners and medical health officers under the Public Health Ordinance. Some of the doctors make patrols to outlying areas and all make use of the radio-telegraphic service in prescribing for those who are unable to obtain treatment at the medical centres.

Hospitals

Twelve hospitals were operated in the Territories during the year, nine by missions of the Roman Catholic Church and the Church of England in Canada, two by mining companies at Yellowknife and Port Radium, and one by the Indian Affairs Branch at Fort Norman until November 1, 1945, when its administration was taken over by the Department of National Health and Welfare. The last-named hospital was destroyed by fire on February 22, 1946. Hospital facilities were also provided by private enterprise at Norman Wells for those engaged on the Canol Project and related activities.

The mission hospitals are situated at Fort Smith, Fort Resolution, Hay River (sick bay), Fort Simpson, Aklavik (2), Rae, Chesterfield, and Pangnirtung. By special arrangement, the Northwest Territories Administration paid the mission hospitals $2.50 per diem for the care of indigent whites, Eskimos, and half-breeds who were admitted on the recommendation of the resident medical officer. In the case of patients suffering from venereal disease, $3 was paid for in-patients, and $1 per diem for out-patients. 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 officers, and the missions receive $200 per person per annum for their care and maintenance. During the year, the sum of $39,368.76 was expended for the care of destitute patients in the hospitals, representing approximately 15,750 days of treatment. Thirty-five patients were accommodated in the industrial homes at a total cost of $6,012.37, and 17 insane patients together with a number of indigents were treated in provincial institutions at a cost of $17,431.80. The above figures do not include the amounts paid by the Indian Affairs Branch for services to Indians only.

Schools

Residential and day schools are operated by the Church of England and the Roman Catholic missions. The residential schools are located at Fort Resolution, Fort Providence, and Aklavik (2), and the mission day schools are located in the principal settlements. Owing to the nomadic tendencies of the natives some of the day schools in the outlying areas are only operated during certain periods of the year when the natives are in the vicinity. During the year 132 children attended the residential schools and 361 pupils attended the day schools. The public schools were operated at Fort Smith and Yellowknife, and were attended by a total of 108 pupils.

Grants totalling $30,190.17 were paid to the various schools and for the maintenance of indigent children in the residential schools. Quantities of school supplies were also furnished.

As the Northwest Territories Administration is responsible for the welfare of all Eskimos, arrangements have been made for the maintenance of a number of destitute children in the residential schools at Fort George, Que. School supplies are also furnished to a number of mission day schools operated within Eskimo territory of the Province of Quebec.

The above figures do not include amounts paid by the Indian Affairs Branch for the maintenance and education of Indian children.

During the year steps were taken to provide for the appointment of a school inspector in the Northwest Territories with headquarters at Yellowknife, whose duties will entail the co-ordination of all educational services in the Territories.

Law and Order

Law and order in the Territories are maintained by the Royal Canadian Mounted Police. Detachments have been established at the more important settlements and extensive patrols are made to outlying areas. To facilitate the administration of justice, four Stipendiary Magistrates have been appointed.

Eastern Arctic Patrol

The annual Eastern Arctic Patrol sailed on the R.M.S. *Nascopie* from Montreal on July 7. The vessel reached Churchill, Manitoba, on August 2, where passengers were exchanged and coal, freight, and supplies loaded for the northern part of the voyage. The vessel made 21 calls and covered a distance of 10,250 geographical miles before returning to Montreal on September 26. J. G. Wright, of the Bureau of Northwest Territories and Yukon Affairs, was the Officer in Charge of the Patrol.

Dr. George MacCarthy and Dr. Campbell Laidlaw, both of Ottawa, served as medical officers on the Patrol as far as Churchill. They rendered valuable service in the examination and treatment of Eskimos as well as white residents at all ports of call on the first half of the voyage. This work was continued from Churchill onward by Dr. Dennis Jordan, of Toronto, and an assisting technician. Together they collected useful research material on blood groupings among the Eskimos. An eye group consisting of Dr. Walter Crewson, ophthalmologist of Hamilton, and two assistants supplied by arrangement with the Canadian National Institute for the Blind, accompanied the northern half of the Patrol from Churchill. They were able to improve the vision of many natives and to conduct a study of eye conditions for future guidance. The dispensary with which the *Nascopie* was fitted in 1944 was used frequently as an operating room by the various medical officers.

The *Nascopie* and auxiliary schooners carried mail and medical and other supplies for all ports in the Eastern Arctic. Royal Canadian Mounted Police detachments were reopened at Port Harrison, Quebec, and Dundas Harbour on Devon Island. A post office was opened at the latter point and thus became the most northerly post office in the British Empire. Building materials were carried for a new radio-sonde station at Port Harrison and for improvements at the meteorological station at Arctic Bay and at several Royal Canadian Mounted Police detachments. Weather and radio station facilities at Southampton Island and the ionospheric station at River Clyde, which until recently were operated by United States interests, were taken over by the Department of Transport. These new activities added considerably to the number of passengers and amount of freight carried on the Patrol.

The health of the Eskimo population was found to be generally good in all regions with the exception of Cape Dorset, where a number of deaths had occurred from a disease which was ultimately diagnosed as typhoid fever. A campaign of immunization was started by the medical officers on the Patrol to prevent the spread of the disease. This work was continued by Dr. N. Rawson, Government Medical Officer at Chesterfield, who early in October was flown to Cape Dorset, where he remained until picked up by an R.C.A.F. plane early in February. Dr. Rawson travelled up and down the coast by boat and later by dog sled, inoculating the natives against typhoid. So far as is known, the disease was completely controlled, and no further deaths have been reported from that cause.

Two unusual incidents occurred on the Patrol. At Lake Harbour a medal awarded by the Royal Canadian Humane Association was presented to Eskimo Tommy (1452) for saving the life of the wife of the Hudson's Bay Company post manager in 1943 when the small boat in which they were travelling was upset by a tide-rip in the icy waters of the outer harbour and all other passengers were drowned. The presentation, the first of its kind to an Eskimo, was made by the Officer in Charge of the Patrol in the presence of some 200 Eskimo and white residents.

When the Patrol was in Lancaster Sound the opportunity was taken to hold a brief ceremony in commemoration of the Franklin Expedition which in 1845, 100 years before, sailed westward through the sound and ultimately perished with no survivors. The *Nascopie* was stopped for fifteen minutes while an appropriate ceremony was held, at the conclusion of which a wreath provided by the Northwest Territories Administration was dropped overboard.

Liquor Permits

The Saskatchewan Liquor Board, as Territorial Liquor Agent, continued the operation of the stores at Yellowknife and Fort Smith under the direction of the Northwest Territories Administration. The restrictions governing supply under Wartime Alcoholic Beverages Order 1942 were removed in 1944 as they applied to beer, and the restrictions on spirits and wine were lifted in 1945. However, only a moderate increase was possible in the available supply for the Territorial liquor stores during the fiscal year. A small increase in the hard liquor ration was made in December, 1945. The liquor sales at the Fort Smith store declined following the termination of activities associated with the Canol Project, but sales at Yellowknife store increased substantially with renewed interest in mining activity in that area.

Net profits from the operation of the liquor stores during the fiscal year amounted to $125,485.01 as compared to $89,392.79 in 1944-45. Profits from the Yellowknife store were $86,530.59 and from the Fort Smith store $38,594.42. Profits from liquor sales and permit fees in the Mackenzie District, together with $1,989.52 derived from fines under the Territorial Liquor Ordinance, were placed in the special liquor account for territorial purposes. The balance in this account as of March 31, 1946, was $419,251.77. The sum of $104 was obtained from the sale of liquor permits issued at Ottawa.

During the fiscal year, 5,205 Class "A" annual permits were issued in the Northwest Territories. Liquor permits issued at Ottawa were 2 Class "B" permits covering sacramental wine and 57 Class "C" permits authorizing the importation of limited quantities of spirits, wine, and beer. Sales at the Territorial liquor stores during the fiscal year were approximately 5,112 gallons of spirits, 1,273 gallons of wine, 2,756 gallons of ale and stout, and 27,150 gallons of beer. Importation permits covered 115 gallons of spirits, 212 gallons of wine, and 120 barrels of beer.

Lands and Timber

Surveyed Lands.—Two settlement lots were sold and patented as follows: Coppermine, 1; Hay River, 1. At Port Radium Settlement, 7 surface leases have been issued. These leases are issued at present for five-year periods.

Unsurveyed Lands.—Small parcels of unsurveyed land suitable for agricultural and fur-farming purposes, as well as tracts with water frontage suitable for transportation and shipping interests, are leased under the provisions of Chapter 113, R.S.C. 1927. The issuing of each lease is authorized by an Order in Council and the number of such leases in force is 35.

Forty-seven permits to occupy Dominion lands during the pleasure of the Department have been granted. There are 3 grazing leases in force, and 5 hay permits were issued under which 69 tons of hay were cut.

During the year 53 assignments affecting lands were registered in the Department.

Timber.—Seventy-eight (78) timber permits, exclusive of those granted in connection with timber berths, were issued, authorizing the cutting of 8,554 linear feet of timber, 150 roof poles, and 3,678 cords of wood. Of these permits, 26 were issued free of dues to educational, religious, and charitable institutions; to settlers for domestic use, and to government departments. Twenty-one timber berth permits were granted under which 1,090,549 feet board measure of lumber were manufactured.

Total revenue derived from lands, timber, grazing, and hay was $27,936.82.

Forest and Wildlife Protection

An important development during the year was the establishment of a service to protect forests and wildlife in Mackenzie District, with local headquarters at Fort Smith. For many years the Mackenzie River Valley has been ravaged by fires, most of them of unknown origin, and owing to lack of adequate preventative measures these fires have often developed into serious conflagrations. For the first time a substantial appropriation has been granted for the organization of forest protection on a more adequate basis.

The new protection service is headed by E. G. Oldham, with the title of Superintendent of Forest and Wildlife Management. Mr. Oldham is a forestry engineer formerly employed by the Forest Service of the Province of British Columbia, and a veteran of World War II. He will be assisted by a technical staff and a warden service. Members of the latter will be assigned definite areas to patrol, including Wood Buffalo Park, and they will assist in the investigation of forest areas and wildlife conditions. Orders were placed for considerable fire-fighting equipment, including three new forest patrol boats. Early in 1946 the new Superintendent completed a trip by aeroplane to all important settlements along Mackenzie River, and conferred with government officers, traders, and trappers at the places visited.

During the year, a number of very large forest fires occurred in the area south of Great Slave Lake and east of Slave River. Other serious fires raged through the northern part of Wood Buffalo Park. A patrol by aeroplane of the latter area in March, 1946, confirmed reports that fires were still burning in moss and underbrush in sections of the park, and necessary action was taken to deal with the situation.

Because of prevailing employment conditions, it was not possible to engage a qualified forester to take charge of forest fire suppression work in Mackenzie District during the summer of 1945. Arrangements were made, however, for the loan of the services of H. L. Holman, District Forest Service Officer at Calgary, Alberta. Mr. Holman proceeded to Fort Smith in April, and under his direction considerable fire-fighting equipment, including pumps and boats, was purchased, and delivered to officers of the Royal Canadian Mounted Police, who acted as forest and game officers at the various settlements. Mr. Holman was also authorized to use aircraft as an aid in spotting fires and for the transportation of men and equipment where required. The serious fire condition required almost continuous attention, and effective action in combating a number of fires which threatened some of the settlements was taken.

It is hoped that the new protective organization, with the assistance of the R.C.M.P. and other Government officers, will be able to institute effective action in preventing further serious loss of valuable forest resources by fire, and that

the necessary field investigations will be conducted at an early date in order to determine the action required to restore to normal the wildlife in Mackenzie District.

Northwest Game Act and Regulations

No person except a native-born Indian (or half-breed leading the life of an Indian) or an Eskimo (or half-breed leading the life of an Eskimo) shall engage in hunting or trapping any game protected under the Regulations without first securing a licence to do so.

The following are eligible for hunting and trapping licences:—

(1) Residents of the Northwest Territories, as defined by these Regulations, who on May 3, 1938, held hunting and trapping licences and who continue to reside in the Northwest Territories.

(2) The children of those who have had their domicile in the Northwest Territories for the past four years, provided such children continue to reside in the Northwest Territories.

(3) Such other persons as the Commissioner of the Northwest Territories may decide are equally entitled to licences under these Regulations.

Only British subjects with four years' residence in the Northwest Territories are eligible for licences under Clause 2. A minor under the age of fourteen years shall not be eligible for a licence. A minor assisting his parents or guardians in connection with hunting or trapping operations will not require a licence.

Fur Production

Fur production during the year was below average. This was attributed in part to forest fires which destroyed much of the cover providing the habitat of wildlife and to the lack of precipitation which resulted in lowering of the water levels, thereby affecting aquatic animals, particularly beaver and muskrats. Investigations indicated that it was desirable to continue full protection for marten throughout Wood Buffalo Park and the Northwest Territories. Beaver also were reported very scarce in many districts and a close season for these animals was established throughout Wood Buffalo Park and the greater part of Mackenzie District. The trapping of beaver, with a bag limit of ten animals to native and resident trappers, was permitted in that part of the Mackenzie District to the north and west of the Liard River and in Yellowknife Game Preserve, where beaver were reported to be fairly plentiful. Muskrat conditions in the delta of Mackenzie River were reported favourable and an average yield was expected. This was in contrast with the situation in the deltas of the Athabaska and Slave Rivers, where conditions were much below average. Another contributing factor to the general fur shortage was the fact that the low ebb of the life cycle for several fur-bearers was reached.

Some of the natives in the Providence and Simpson Districts complained of inability to secure sufficient fur to allow them to purchase needed supplies. Cases of this nature were investigated by the local Indian Agent and the R.C.M.P. and relief supplies were issued where necessary. Surveys were planned by field officers to ascertain the present status of beaver and marten and to determine whether any modification of the trapping restrictions should be authorized for the ensuing season. Fur conservation activities are under consideration for areas which lend themselves to such developments.

Wood Buffalo Park

Investigations made by J. D. Soper early in 1945 confirmed reports of severe damage to the forests in Wood Buffalo Park by fires and of the depletion of the beaver, marten, and muskrats. The appointment of a number of new wardens to the staff was made in order to give more supervision to the forest fire situation and to take prompt action in suppressing fires. A tractor and other mechanical equipment, including dump trucks and general purpose vehicles, were ordered for delivery in 1946 for use in constructing roads and trails into the remote areas to facilitate patrolling of the park, and to assist in suppressing forest fires. The continued low water conditions in the delta of the Athabaska River reduced the muskrat population in this part of the park to the smallest on record. As opportunity permits, surveys of conditions which affect the delta will be carried out.

Buffalo were reported to be thriving and many calves were observed. Available grazing areas were estimated to be greatly in excess of present requirements. Fifty-seven old male buffalo were slaughtered to provide meat for distribution to hospitals, missions and Indian Agents, providing treatment and facilities to natives in needy circumstances.

General

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

Comparative figures of the number of big game animals and birds taken during the licence years ended June 30, 1944, and 1945, and the average for the 5 years ended June 30, 1944, follow:—

—	Year ended June 30		5-year Average 1940-1944
	1945[2]	1944[1]	
Big Game—			
Caribou	28,704	22,763	21,006
Deer	44	82	69
Moose	790	693	1,062
Sheep	44	7	48
Goat	5	0	10
Game Birds—			
Ducks	11,850	9,525	11,705
Geese	656	227	804
Grouse	198	532	821
Partridge	489	571	2,065
Prairie Chicken	696	640	1,691
Ptarmigan	5,945	4,872	8,070

Licences, Permits and Revenue.—Comparative statement of licences and permits issued and revenue derived under the Northwest Game Act.

—	Licences Year ended June 30		5-year Average 1941-45
	1946[2]	1945	
Hunting and Trapping—			
Resident	449	506	524
Non-Resident Bird Licence	33	30	23
Trading and Trafficking—			
Resident	124	110	115
Non-resident	3	3	6
Non-resident—non-British	1	.....	.....

—	Permits Year ended June 30		5-year Average 1941-1945
	1946[2]	1945[1]	
To establish trading posts	8	8	16
To take mammals	2	3	3
To hunt and trap in Wood Buffalo Park	246	309	335
To take migratory birds	5	3	8
To take scientific specimens	3	5	5
To take quota (10) beaver	476	1,367	1,442

[1] These figures may differ slightly from those recorded in the Annual Report for 1944-45 because of additional returns received after that report was printed.

[2] Subject to revision as additional returns are received.

Revenue.—Revenue under Northwest Game Act for fiscal years ended March 31, 1945 and 1946, and average for 5 years 1941-45 are shown hereunder:—

—	Fiscal Year		5-year Average 1941-45
	1945-46	1944-45	
	$ cts.	$ cts.	$ cts.
Hunting licences	994 00	980 00	1,069 95
Trading licences	1,386 90	1,065 00	1,784 44
Bird licences	78 00	111 00	164 20
Fur farm licences	15 00	20 00	19 40
Trading post permits	6 00	12 00	13 80
Sale of furs	3,341 50	3,192 28	1,433 62
Fur export tax	56,834 64	62,751 18	92,370 68
Permit to export live furbearers	100 30	.....	.....
Fines and forfeitures	90 00	326 78	528 55
Sub-total	62,846 34	68,458 24	
Revenue under the Businesses, Callings, Trades and Occupations Ordinance, fiscal year ended March 31, 1946	5,875 50	6,366 50	
	68,721 84	74,824 74	

Infraction of Game Laws.—There was one prosecution and conviction for infraction of the game laws.

Reindeer

The reindeer herd on the Government reserve immediately east of the Mackenzie Delta was maintained in good condition. The problem of corralling the deer at the summer round-up has become more difficult in recent years. The reindeer were brought together in July, 1945, but the count and classification of the animals was not completed. Measures have been initiated to secure expert advice on handling the herd and improving the fencing and corralling arrangements. Reductions in the herd reported during the fiscal year were normal and included 403 deer taken for meat. The usual donation of 100 carcasses was made to mission hospitals and residential schools. Revenue from the sale of reindeer products amounted to $4,106.

Some of the reindeer contained in two herds under native management near Anderson River were brought together after the proprietors of these herds lost their lives in the wreck of the native schooner *Cally* in September, 1944. These animals, now under Government management as the "Anderson River Herd", totalled about 2,000 head in the summer of 1945.

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The abundant fur yield and high prices which have prevailed in the Mackenzie Delta area for a number of years tend to attract the young natives to trapping rather than to reindeer herding. This situation makes it difficult to maintain a sufficient number of qualified herders and apprentices to keep effective control over the herds and to extend the industry as the reindeer increase in number. However, it is the policy of the Administration to continue with such developments and improvements as may be possible with a view to carrying out the objects of this enterprise in the interests of the natives.

Mining

Yellowknife continued to be the centre of mineral development in the Northwest Territories. Although mining activity, including underground development, was greatest in the vicinity of Yellowknife Bay and River, exploration and staking have extended northward to the Indin Lake area, about 135 miles north of Yellowknife Settlement, northeastward to the treeless barrens in the vicinity of Courageous Lake, and eastward along the Hearne Channel of Great Slave Lake. Considerable mining activity has also occurred in the Thompson Lake, Gordon Lake, and Beaulieu River areas within a 75-mile radius of Yellowknife Settlement.

Interest in the Yellowknife mining district was accentuated by several developments. Among these were the decision of the Dominion Government to make available additional hydro-electric power in the region by development of power sites on Snare River. Details of the proposed development will be found in the report of the Director of Surveys and Engineering. An agreement reached between the Dominion Government and the Province of Alberta for construction of an all-weather road linking railhead at Grimshaw, Alberta, with Hay River Settlement, N.W.T., on Great Slave Lake, is expected to result in improved facilities for transportation of mining equipment and supplies. Gratifying reports which followed diamond drilling and exploration on properties of Giant, Negus, and other mines, an improvement in labour conditions, and an easing of essential supplies have all contributed to a continued expansion of the mining industry.

More than 200 companies have been incorporated for operation in the Northwest Territories, the greater number having interests in the Yellowknife field. As additional groups of claims become available for exploratory work, the total may be expected to increase. The expansion in mining activity is reflected in the revenue derived from fees collected under the Quartz Mining Regulations. For the year ended March 31, 1946, revenue from that source amounted to $184,019, or approximately double that collected during the previous year.

Gold production was resumed in the Territories during the year. Negus Mines, Limited, which suspended milling in October, 1944, resumed operations in July, 1945, and production of 12,243 ounces of gold and 3,096 ounces of silver was reported for the period ended March 31, 1946. Development work was continued at the Con and Rycon mines, and a resumption of gold production at these properties, as well as at Thompson Lundmark Gold Mines, Limited, has been forecast for the year 1946-47.

Of the properties under development that of Giant-Yellowknife Gold Mines Limited in the Yellowknife River area has shown considerable progress. At the end of the fiscal year, one shaft had been completed to a depth of 500 feet, and the sinking of a second shaft was under way. The sinking of a shaft at the property of Crestaurum Mines Limited has also been commenced. Construction of roads connecting the Giant and Crestaurum properties with Yellowknife Settlement were also undertaken.

Prospecting was carried farther afield. In addition to that carried on in new territory, intensive prospecting of older claims was also undertaken. This type of work should tend to promote faster and more rapid growth of the mining industry. Yellowknife mining district comprises an immense area, and many localities have as yet received only casual examination. Although thousands of claims have been staked, a great many await geological examination. The seven principal mining areas under investigation and development in the Yellowknife District are as follows: Yellowknife Bay and River; Gordon Lake; Beaulieu River; Indin Lake; MacKay-Courageous Lakes, Russell-Slemon Lakes and Hearne Channel (Great Slave Lake).

In the Great Bear Lake area, the mill and mine of Eldorado Mining and Refining (1944) Limited at Labine Point continued operations at capacity during the year, with about 200 persons employed. The development of atomic research with the aid of uranium, one of the principal products of the mine, has made the property one of the most valuable on the continent. It has been operated as a Crown company since 1944, and for security reasons, production figures are treated as confidential.

The value of mineral production in the Northwest Territories for the past three years, together with the total value of production to date, is indicated by the following figures which have been released by the Dominion Bureau of Statistics:—

Mineral	Production for 1943	Production for 1944	Production for 1945	Total Production to End of 1945
Gold	$2,272,732	$ 799,838	$333,218	$14,343,619
Silver	5,996	5,881	956	837,523
Lead	..	..	..	490
Copper	..	1,428	..	24,102
Tungsten	729	..	..	37,674
Pitchblende Products	..	..	..	5,805,423*
Petroleum	400,201	632,587	136,303	1,645,104
Natural Gas	335	335	335	3,260
	$2,679,993	$1,440,069	$470,812	$22,697,195

*Total to end of 1941. The value of pitchblende products, including radium and uranium, for 1942, 1943, 1944 and 1945, is not available for publication.

During the fiscal year, 1,432 miner's licences and 1,516 renewals of miner's licences were sold; 8,625 quartz grants were issued and 5,508 assignments of mineral claims were recorded. In addition to the above, 15 leases comprising 749·29 acres were issued under the Quartz Mining Regulations.

Coal.—At present there are no coal mining leases in force in the Northwest Territories but there are three Domestic Coal Mining Permits in force in the Unorganized Districts.

Petroleum and Natural Gas.—The agreement between the Crown and Imperial Oil Limited, covering the "proven area" (7,939 acres) at Norman Wells, came into effect on May 3, 1945. This agreement is essentially a lease and comprises the only area in the Northwest Territories under which oil has been found and produced. One permit (255,633 acres) issued under the regulations, approved June 3, 1945, has been abandoned and two new permits have been issued under the same regulations, one in the Norman area (256,000 acres) and one on the Hay River (646 acres). The total area at present under permit is 2,242,284 acres. Six leases comprising an area of 3,279·23 acres and the above-mentioned "proven area" are in good standing. With the disuse of the Canol Pipe Line many wells were capped and during the fiscal year, on a monthly average, seven wells were operated to supply the Territorial market only. The Canol Project was terminated on March 8, 1945. During the period of its existence, April, 1942, to March 8, 1945, a total of 1,858,447 barrels was produced from the Norman field. Oil production during the fiscal year 1945-46 was 69,434 barrels.

Dredging.—Two five-mile stretches under lease on Grizzly and Bennett Creeks produced a combined revenue of $106.75.

Yellowknife Administrative District

The Local Trustee Board of Yellowknife, which has functioned since January 1, 1940, was increased in number from 5 to 7 members, effective January 1, 1946. During the year the Board held 21 meetings and passed several by-laws including those covering the assessment of property and the rate of taxation. Many other matters of interest to the community were also discussed and passed upon by the Board.

Townsite Development

Increased mining activity in the Yellowknife District with a corresponding increase in population made necessary an extension of the settlement of Yellowknife. During the year many lots suitable for business and residential purposes were surveyed on a suitable area about a mile southwest of the original townsite. Most of the lots made available had been leased at the close of the fiscal year, when plans were being made for an additional survey.

A scarcity of materials delayed the construction of buildings to be erected both by Government agency and by private enterprise, but plans were completed for a number of new structures including an administration building, staff quarters, and a new store for the sale of liquor. A campaign for funds to meet the cost of erecting a modern hospital, with Government assistance, was also undertaken in the settlement.

Public Improvements

Public roads in the principal settlements of Mackenzie District and roads leading to adjacent aerodromes were maintained during the year by the Department of Transport from funds provided by the Northwest Territories Administration. The two portage motor roads connecting Fort Fitzgerald, Alberta, with Fort Smith, Northwest Territories, were kept in serviceable condition by Northern Freighters, Limited, and Northern Transportation Co., Limited. The latter company also maintained the road connecting Fort Smith with Bell Rock, where the company's warehouse and wharf are located.

Progress was made by the Department of Transport in the development of an airport at Long Lake, about four miles from Yellowknife, and one landing strip, 5,000 by 500 feet, was completed. Preliminary work was also carried out on a second strip which will measure 5,000 by 500 feet when completed. The Department of Transport also constructed an access road connecting the airport with the settlement of Yellowknife. The airport was used during the winter of 1946 by the R.C.A.F. as a base for aircraft services provided in connection with "Operation Musk-Ox". The development of the airport also facilitated the movement of personnel and supplies required by the mining industry in the Yellowknife district. It will continue to be an important adjunct to the community as the mining industry expands farther afield.

Giant-Yellowknife Gold Mines, Ltd., built a road connecting the mine with the new townsite addition to Yellowknife, and an extension of this road to the property of Crestaurum Mines, Ltd., was commenced by the latter company. Financial contributions towards this work were made by the Northwest Territories Administration. A winter tractor road was opened from Slemon Lake to the Indin Lake area north of Great Slave Lake which permitted mining companies to transport supplies to their properties.

The section of the Grimshaw-Hay River winter road within the Territories was maintained by one of the transportation companies using the route, with financial aid from the Northwest Territories Administration. Four companies operated tractor trains from the terminus of the road, at the mouth of Hay River, across Great Slave Lake to Yellowknife. During the year an agreement was reached between the Dominion Government and the Government of Alberta providing for the construction of an all-weather highway linking Grimshaw and Hay River. The Dominion Government will share the cost of the section of the highway situated within the Province and the cost of constructing the section within the Northwest Territories will be borne entirely by the Dominion Government. The agreement provided that work on the highway will commence not later than May 1946, and be completed by the end of 1947.

An area situated about a mile southwest of the original settlement of Yellowknife was sub-divided into building lots during the year to meet the requirements of a greatly increased population. Surveys and other necessary investigations were made to provide for future installation of power, water, and sewer services in the new townsite area.

Landing fields for aircraft along the Mackenzie River Route in the Mackenzie District as far north as Norman Wells were maintained for use by wheel-equipped aircraft by the Department of Transport, which also provided meteorological services and facilities for refuelling. Radio communication services were maintained at a number of these stations by the Royal Canadian Corps of Signals, Department of National Defence. One permanent landing strip was constructed at the Long Lake aerodrome near Yellowknife to replace the temporary strip previously used.

The Department of Transport continued the maintenance of aids to navigation along portions of the Mackenzie River waterway including points on Slave River, Great Slave Lake, Mackenzie River, and Great Bear Lake. Such aids now include 5 sets of range lights, 19 beacon lights, and 4 light buoys. Buoyage or channel marks suitable to available depths are also provided at various points along the waterway.

The Royal Canadian Corps of Signals also maintained a system of wireless communication in the Northwest Territories and Yukon which now consists of 19 radio stations extending through from Alberta to the Arctic Ocean. This system provides an outlet for approximately 32 additional stations owned and operated by commercial organizations such as mining, transportation, and trading companies. Connections were also maintained with Department of Transport stations, the Alaska Communications System, and with Canadian commercial telegraph companies at Edmonton.

Scientific Surveys

During the year the Surveys and Engineering Branch, through its Dominion Water and Power Bureau, continued stream measurement and investigation of possible water power development in the Northwest Territories. Field investigations were undertaken in the Yellowknife area as a result of increased mining activity there. Reconnaissance engineers inspected the Lockhart River power site as well as power sites on Snare River. Hydrographic surveys were made by the Department of Public Works and the Hydrographic Service of the Department of Mines and Resources at the western end of Great Slave Lake and down Mackenzie River to Fort Simpson. A new channel through Green Island Rapids on Mackenzie River above Fort Simpson was examined and charted.

Engineers of the Department of Public Works carried out a complete harbourage survey at Fort Smith which was extended along the west shore of Slave River to Bell Rock. Surveys were also completed at Fort Resolution, Deadman's Island, Buffalo River, and Yellowknife.

During the 1945 season, surveys of the section of the 7th Meridian and the 36th Base Line in the Northwest Territories were made by the Legal Surveys and Map Service of the Department. These surveys give map control and assist in the location of mining claims and other areas.

The Geological Survey of Canada had four parties in the field during the year. Three of these were engaged in detailed mapping in the vicinity of Great Bear Lake and the fourth was engaged in completing geological mapping of the Ross Lake area some 30 miles northeast of Yellowknife. The detailed work was designed to aid the discovery of pitchblende or other uranium-bearing minerals and was carried on in close co-operation with Eldorado Mining and Refining, a Crown company.

Biological investigations of waters in the Northwest Territories including Great Slave and Great Bear Lakes were continued by the Fisheries Research Board of Canada. The summer's investigations supplemented those inaugurated in 1944, and provided much additional information about the available supply of fish. Gill-net sampling in Great Slave Lake resulted in an average catch comparable to that obtained in 1944.

During the year an Alberta fish company operated on Great Slave Lake under a commercial licence and obtained a catch of approximately 1,300,000 pounds—chiefly trout, with smaller quantities of whitefish and inconnu. The greater part of the catch was processed as fillets at the lake with the aid of mechanical quick freezing equipment and was transported on refrigerator barges to railhead at Waterways for shipment to markets in Eastern Canada and the United States.

Aerial Mapping

Considerable aerial photography was carried out by the Royal Canadian Air Force during the year. In Yellowknife mining district an area of 14,054 square miles was covered by vertical photography for mapping purposes. These aerial photographs are essential in unsurveyed territory for the graphical representation of mining claims.

In the Great Bear Lake region, an area of 672 square miles was photographed to permit the study of mining possibilities of the region, particularly with reference to the location of bodies of uranium and radium-bearing ores.

An area of 18,096 square miles straddling the Mackenzie River Valley was photographed to permit the study of potential oil-producing territory. Wood Buffalo Park, comprising an area of 17,300 square miles, together with an additional 412 square miles around its borders, was also photographed for forest and wildlife management purposes.

In addition to the specific purposes mentioned, the photographs so obtained will be utilized for general mapping purposes, and for use in connection with the national forest inventory being undertaken by the Dominion Forest Service of the Branch.

Agriculture

During the summer exploratory soil surveys, inaugurated in 1944, were continued by Dr. A. Leahey, of the Experimental Farms Service, Department of Agriculture, along Mackenzie River from Fort Simpson to Aklavik. More comprehensive investigations were also made of soil conditions on Salt River plains near Fort Smith, in Yellowknife Settlement and vicinity, and in the Fort Simpson area.

In an endeavour to improve gardening and other forms of horticulture in Mackenzie District, a selected group of 34 residents of various settlements along the Mackenzie River system between Fort Fitzgerald, in Alberta, and Aklavik, N.W.T., received free parcels of selected garden seeds, plants, roots, fertilizer, and insecticides from the Experimental Farms Service. This distribution was followed up by visits made by F. V. Hutton, horticulturist of the Experimental Farms Service, who furnished personal advisory services and inspected results. In connection with this horticultural effort, experimental garden and grass plots

were laid out at Yellowknife Settlement on suitable land. The results of the season's work, which was tentative in scope, were satisfactory, and served as a basis for more intensive plans in 1946.

At a meeting of the Interdepartmental Committee on Agriculture, composed of officers of the Departments of Agriculture and Mines and Resources, the establishment of an agricultural substation at Fort Simpson during 1946 was discussed and approved, and the necessary preliminary arrangements were made.

Geographic and Economic Research

Research studies dealing with the geography, natural resources, and peoples of the Northwest Territories were continued by the Bureau's geographer The compilation and analysis of information obtained from official records and files was supplemented by field work carried out in Mackenzie River Valley during the summer. Studies in the field entailed investigations of several days' duration at each of the settlements in Mackenzie Valley. Such visits were made in the course of travel by air and boat through the district as far north as Aklavik and east to Reliance.

As a result of field studies, much additional information was obtained for the records of the Bureau. Particular attention was devoted to matters connected with water transportation, fur production and the cycle of fur-bearing animals, settlement growth and mapping, location of Indian camp-sites, climatic conditions including those associated with the opening and closing of water transportation, population, and the general distribution of natural resources.

A research assistant was engaged to assist in assembling more rapidly information about Yukon and the Northwest Territories. Much of the data compiled was later published in a series of articles in the *Canadian Geographical Journal*. Reprints of the articles were purchased for distribution.

Publicity and Information

Request for general and special information on Northern Canada continued to be heavy, and to meet the demand reprints of the multilithed booklets *The Northwest Territories, The Yukon Territory,* and *An Outline of the Canadian Eastern Arctic* were printed. In addition, reprints of articles in the *Canadian Geographical Journal* which described in detail the geography, peoples, natural resources, and facilities for transportation in Mackenzie District of the Northwest Territories, and in the Yukon Territory, were issued in co-operation with the Canadian Geographical Society. A special article, *Physical Geography of the Canadian Eastern Arctic,* was prepared for inclusion in the 1945 Canada Year Book, and a number of reprints in English and French were obtained for selected distribution.

A list of the publications printed during the year for general distribution follows:

The Northwest Territories—Administration, Resources, Development.

The Yukon Territory—Administration, Resources, Development.

An Outline of the Canadian Eastern Arctic—Its Geography, Peoples and Problems.

Physical Geography of the Canadian Eastern Arctic.

Agriculture and Forests in Yukon Territory.

Land Use Possibilities in Mackenzie District, N.W.T.

Fur Production in the Northwest Territories.

Water Transportation in the Canadian Northwest.

Numerous requests for special information were dealt with by correspondence, and writers, editors, publishers, and others were supplied with articles, photographs, half-tones, and maps. Considerable effort was also expended in the revision of sections of encyclopedias and other works of reference describing the Yukon and Northwest Territories.

YUKON TERRITORY

Yukon Territory has an area of 207,076 square miles. It is bounded on the south by British Columbia and Alaska; on the west by Alaska (longitude 141 degrees west); on the north by the Arctic Ocean, and on the east by the Northwest Territories. Most of the Yukon's present population is found in three areas; the northern or Dawson District, the southern or Whitehorse District, and the Upper Stewart River or Mayo District. According to the 1941 census, the population of Yukon Territory was 4,914. This figure, however, has been increased by new developments including a revival of the mining industry. The population of the Territory, as of December 31, 1945, was approximately 7,000.

The Yukon was created a separate territory in June, 1898. Provision is made for a local government composed of a chief executive, called the Controller, also an Elective Legislative Council of three members, with a three-year tenure of office. The Controller administers Government measures and works under instructions from the Governor in Council or the Minister of Mines and Resources. The Controller in Council has power to make ordinances dealing with the imposition of local taxes, sale of liquor, preservation of game, establishment of territorial offices, maintenance of prisons and municipal institutions, issue of licences, incorporation of companies, solemnization of marriages, property and civil rights, administration of justice, and generally all matters of a local and private nature in the Territory. The seat of government is at Dawson, Y.T.

Territorial Council

The Yukon Territorial Council, elected for a three-year term on February 9, 1944, is composed as follows: Dawson District, John R. Fraser, Dawson; Mayo District, Ernest J. Corp, Keno Hill; Whitehorse District, Alexander A. Smith, Whitehorse. The Controller of Yukon Territory is G. A. Jeckell, Dawson.

Work of Council

The Yukon Council met on April 16, and was prorogued on April 30, 1945. The annual supply bill was passed, and new ordinances passed as follows: to Provide for the Protection of Children; Respecting the Protection and Care of Archaeological Sites; Respecting the Practice of Optometry; Governing the Storage, etc., of Inflammable Petroleum Products; for the Incorporation of Co-operative Associations and to Provide for their Regulation; for Granting Supply. In addition, the following ordinances were amended: Medical, Dental, Assessment, Motor Vehicle, Legal Profession, Game, Respecting Benevolent and other Societies, Succession Duty, Bills of Sale, Hire Receipts and Conditional Sale of Goods, Adoption of Infants, Bounties on Wolves and Coyotes, the Woodmen's Lien, Liquor, to Regulate the Hours of Labour and the Minimum Wage to be paid in Mining Operations, the Sidewalks Ordinance, and the Fire Prevention Ordinance.

Administration

The Lands, Parks and Forests Branch of the Department at Ottawa is responsible for the transaction of business arising from the general administration of the Territory under the Yukon Act and ordinances passed by the Territorial Council; for the disposal of lands under the Dominion Lands Act; for the administration of the Yukon Placer and Quartz Mining Act, and for the collection of revenue.

The revenue collected under Territorial Government ordinances during the year was $92,984.97. The amount transferred from the liquor account to general account was $320,000. Expenditures from the Yukon Consolidated Revenue Fund were $417,340.85. The Territorial Government received no grant from the Dominion Government during the year.

Mining

A substantial increase in gold production, continuation of prospecting, and a remarkable expansion in staking featured the mining industry in Yukon Territory during the 1945 season. This activity was almost wholly on land administered under the Placer Mining Act. Several large corporations investigated lode properties during the year, and it is anticipated that, with an expected increase in supply of both labour and material, operations will be extended to lands administered under the Quartz Mining Act.

Gold production for the year was 40,049·97 ounces, the value of which, at $35 an ounce, is $1,401,749, or an increase of $372,387 over the preceding year.

Entries were granted for 138 placer and 299 quartz mining claims and 3,135 such claims were renewed for another year. Twenty-one quartz mining leases were renewed. Seven new leases were issued and two leases expired. The area held under such leases is 5,154·57 acres.

A total of 522 miles of river and creek beds has been conveyed by prospecting leases issued under the Placer Mining Act.

About 100 tons of high grade silver-lead ore were shipped out of the Territory for treatment but no new mines were brought into production during the year.

Gold Royalty.—The total amount collected for royalty on gold obtained from placer deposits up to March 31, 1946, was $5,352,121.64, of which $1,501.84 was collected during the fiscal year.

Dredging Leases.—Six leases permitting the lessee to dredge for minerals in the beds of rivers in the Territory were in force and comprise a total length of 34½ miles. The rental received from these leases up to March 31, 1946, amounted to $213,621.97, of which $1,574.30 was collected during the fiscal year. One new lease was issued covering 10 miles of the Finlayson River.

Hydraulic Mining Locations.—Four hydraulic mining locations are still held under leases issued under the old regulations which were withdrawn by Order in Council dated February 2, 1904. These leases comprise a total stretch of 16 linear miles. Rentals amounting to $220,638 have been collected to date on account of such locations. The amount received during the past year was $2,390.

Coal Mining Leases.—Two coal mining leases comprising an area of 77 acres are in good standing. The revenue for the year from this source amounted to $2.60.

PLACER MINING

On March 31, 1946, 2,734 placer claims were in good standing in the Dawson District. The majority of the claims are held by the Yukon Consolidated Gold Corporation, which operated three dredges, expended a total of $413,319 on salaries and wages, and employed an average of 112 men during each month of the year. No. 3 dredge operated in the Klondike Valley, digging ground buried under the Jackson Gulch hydraulic tailings. No. 7 dredge operated on Quartz Creek and No. 11 dredge worked on Middle Hunker Creek digging ground of which part had been previously worked. Stripping and thawing operations were restricted owing to the prevailing scarcity of labour.

Clear Creek Placers Limited continued work with one dredge on the left fork of Clear Creek with satisfactory results. In the Mayo District the only producer was Ole Lunde, who operated on Dublin Gulch.

In the Whitehorse District, Barker and Ray continued operations with the aid of a bulldozer and shovel on Shorty Creek. George Murray worked on Bates and Iron Creeks, and Frome on Burwash Creek. These operators, together with a few individuals in Kluane and Big Salmon areas, produced the 981·74 ounces of gold presented for royalty tax in this district.

The royalty export tax collected was contributed as follows:

Dawson—$14,536.69; Whitehorse—$368.24; Mayo—$113.91.

LODE MINING

Dawson District.—Entries were granted for 185 quartz claims staked during the year, and 209 claims previously staked were renewed.

Mayo District.—Entries were granted for 77 new quartz claims, and 284 claims were renewed.

Whitehorse.—Entries were granted for 36 new quartz claims, and 64 claims were renewed.

Order in Council P.C. 4574 of June 4, 1943, which provided for the suspension of representation work required by the Yukon Quartz and Placer Mining Acts, was in force throughout the year. By this suspension, the owners of mining rights were encouraged to retain possession of their holdings until supplies and labour are available.

Territorial Assay Office.—The Assay Office at Keno Hill was maintained by the Territorial Government. Nine hundred and ninety-eight rock samples drawn from the Territory in general were received and 1,309 quantitative analyses were made. In addition, analyses and chemical tests were made in connection with identification and classification of various rocks and minerals. The assays made were—gold and silver, 998; lead, 287; copper, 10; zinc, 13; and nickel, 1.

PROSPECTING

As stated above, several new companies have entered the Territorial field. The Yukon Alluvial Golds Limited, a company allied to Clear Creek Placers Limited, carried out a drilling program on Thistle and Barker Creeks. The work on Barker Creek was discontinued but the company intends to operate one dredge on each of Thistle and Henderson Creeks.

The Sunshine Mining Company of Idaho drilled on Big Gold, Glacier, and Forty Mile Creeks and have mapped out a development program.

New locations were confined mainly to the Nansen Creek area east of Teslin, where a notable discovery was made, and also to the Mayo District.

The Yukon Northwest Exploration Company acquired claims on Keno Hill and intends to start development in 1946. The properties of the Treadwell Yukon Corporation were acquired by a newly-incorporated company, Keno Hill Mining Company, Limited, which also expects to commence operations during 1946.

LANDS AND TIMBER

Lands.—During the year 4 lots were sold and patented. There are now in force 10 agricultural leases, 1 grazing lease, 18 permits to occupy Dominion lands, 22 waterfront leases, 2 miscellaneous leases, and 23 homestead entries.

The revenue from lands was $7,075.33.

Timber.—The number of permits issued was 130, authorizing the cutting of 953,657 feet board measure of saw-timber and 11,008 cords of wood. Fourteen licence timber berths were in force. There were 4 timber seizures.

The total revenue amounted to $6,388.63.

FOREST PROTECTION

The development of the Forest Protective Service in Yukon Territory, which was inaugurated in 1943, was continued. The organization, headed by a qualified forest engineer, includes a warden staff with headquarters at Whitehorse. Considerable fire-fighting equipment was obtained and distributed during the year at strategic areas in the southern part of the Territory. To date, forest protection has been confined to the main arteries of travel including the Alaska Highway, Haines Cut-off, and Lewes-Yukon River systems. The Officer in Charge assisted the Crown Timber and Lands Agent at Whitehorse in the administration of timber and public lands in southern Yukon. He also served as liaison officer for the Department in matters affecting United States Army authorities who were responsible for the maintenance of the Alaska Highway and access roads in Yukon Territory.

THE ALASKA HIGHWAY

Maintenance of the Alaska Highway which links Dawson Creek, B.C., with Fairbanks, Alaska, and traverses approximately 600 miles of Yukon Territory, was continued by the United States Army during the year. The work was carried on from eighteen maintenance camps in Canada, of which eight were located in the Yukon. Major construction was limited to two permanent steel and concrete bridges, one of which crossed Beaver Creek at Mile 1,200 and the other Snag Creek at Mile 1,208. Telephone and telegraph lines along the highway were also maintained together with flight strips which were constructed for use in contact flying. Airports and intermediate aerodromes along the Northwest Staging Route, some of which were improved by the United States authorities with expenditures reimbursed by Canada, together with access roads leading to airports and aerodromes, were maintained by the Royal Canadian Air Force.

The Joint Traffic Control Board, with headquarters at Edmonton, continued to supervise travel on the highway, which was restricted to persons on official business and to bona fide prospectors.

In the early autumn the operation of bus services on the Alaska Highway was arranged by the United States Army to replace services previously operated by the latter, and was provided chiefly for the benefit of United States Army personnel and civilian employees. The section from Fairbanks to Whitehorse was operated under contract by the O'Harra Bus Company of Fairbanks, and the section from Whitehorse to Dawson Creek under contract by the British Yukon Navigation Company. Policing of the highway was taken over from the United States Military Police by the Royal Canadian Mounted Police on July 1. The operation of gasoline stations at points along the highway in British Columbia was assumed during the year by the Imperial Oil, Limited.

The Haines Cut-off, which connects Haines, Alaska, with the highway at a point approximately 100 miles west of Whitehorse, was opened for traffic on July 1 and closed during the latter part of September.

During the latter part of the fiscal year, arrangements were completed for the transfer of control of the highway and access roads, from United States authority to the Department of National Defence (Army) on April 1, 1946.

Inspecting engineers of the Engineering and Construction Service of the Department of Mines and Resources were located at Whitehorse, Y.T., and Fort Nelson, B.C., in connection with the maintenance of the highway by the United States authorities. Regular and detailed reports describing the condition of the highway were furnished by these engineers for the information of the Department.

The Canol Project

Although activities associated with the Canol Project at Norman Wells, Northwest Territories, and elsewhere were ordered discontinued on March 8 1945, by the United States Government, operation of the oil refinery at Whitehorse was continued into April 1945, in order to process crude oil stocks on hand. Supplementary fuel pipelines, including those from Skagway to Whitehorse, Carcross to Watson Lake, and Whitehorse to Fairbanks, were used for the transmission of gasoline supplies. Use of the service road paralleling the Canol pipeline from Johnson's Corners, Yukon Territory, to Norman Wells was discontinued, following the destruction by flood waters of a number of bridges along the route. This road has since been officially closed to traffic.

Roads and Bridges

In addition to the work carried out on the Alaska Highway and access roads by United States authority, other roads in Yukon Territory were improved and maintained by the Territorial Government. This work was confined to roads in use, and a total of $72,867.23 was expended. The construction of a mining road to link the Clear Creek mining area with Dawson was commenced, but work was hampered by a lack of suitable labour and a shortage of equipment.

Aircraft Landing Facilities

Complementing the maintenance of airports and aerodromes along the Northwest Staging Route by the Royal Canadian Air Force was an expenditure of $3,425.85 by the Territorial Government on maintenance of and repairs to landing fields under its supervision. In addition the sum of $5,000 was used to purchase an area of cleared land required to lengthen the landing field at Dawson. Landing fields at Dawson and Mayo were maintained in good condition during the winter months by the Territorial Government.

Agriculture

A wet season resulted in poor field crops in the Territory. The growth of grasses was good, but poor weather prevented successful harvesting. Excellent garden crops, however, were grown in the Dawson area, and good yields were obtained.

Progress was made by the Experimental Farms Service of the Department of Agriculture in the establishment of an agricultural experiment substation at Pine Creek on the Alaska Highway about 100 miles west of Whitehorse. About fifteen acres of land were cleared with the aid of a bulldozer and later most of this area was plowed. Buildings erected during the year included workmen's cottages, a residence for the superintendent, and a garage. The Superintendent, J. W. Abbott, visited most of the settlements along the Lewes and Yukon Rivers, and furnished valuable advice to farmers and market gardeners in the region.

Fur and Game

Collections made under the Fur Export Tax Ordinance amounted to $10,618.49, an increase of $3,018.62 over the previous year. An increase in the number of fisher, cross and red fox, lynx, marten, mink, otter, weasel, and wolverine pelts was reported. The number of coyote pelts presented for tax was 37 and the number of wolf pelts, 63. Revenue from Game Ordinance licences was $5,410, an increase of $71 from the previous year. Bounty payments for wolves and coyotes totalled $10,065, payments being made on 400 wolves and 272 coyotes.

Public Welfare

The health of the white population in the Territory was reported as generally good, but an increase in tuberculosis among Indians was noted. The incidence of venereal disease in the Whitehorse area and southern Yukon also increased, the source of infection in the majority of cases being of Indian parentage. A close check was made of all cases reported and the Venereal Disease Ordinance was enforced as far as possible. Preventative inoculations were continued during the year for diphtheria, smallpox, and other diseases by Medical Health Officers and the travelling nurse of the Indian Affairs Branch.

Registrations under the Vital Statistics Ordinance during the year were 196 births, 78 marriages, and 94 deaths. The Government hospital at Whitehorse and St. Mary's Hospital at Dawson were operated throughout the year, and grants toward their maintenance were provided by Council. Hospital days for patients during the year were: Whitehorse 7,865; Dawson 16,450. A public nurse was employed in Mayo District for three months, but for the remainder of the year no nurse was available.

The sum of $36,004.84 was expended for relief. A total of $3,747.29 was paid to St. Paul's Hostel, Dawson, for the care of all indigent half-breed and white children who attended the Dawson School.

Education

Seven schools were maintained in the Territory during the year, including two at Dawson and one each at Whitehorse, Mayo, Carcross, Teslin, and Destruction Bay. The total number of pupils enrolled during the school year ended June 30, 1945, was 441, and the total number of pupils enrolled as of March 31, 1946, was 332. The number of teachers employed was 14. The total amount expended on education was $61,671.82.

Law and Order

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

Scientific Surveys

During the 1945 season engineers of the Surveys and Engineering Branch of the Department carried out aerial and ground reconnaissance of roads to be located between Whitehorse and Dawson and between a point on the Alaska Highway near Jakes Corner, Y.T. and Atlin, B.C.

Engineers of the Geodetic Service, Surveys and Engineering Branch, undertook considerable work in Yukon Territory related to horizontal and vertical control for mapping purposes. Precise level lines for vertical control were continued during the year. Approximately 218 miles of levelling was carried out along the British Columbia section and about 237 miles along the Yukon Territory section of the Alaska Highway. An inspection of bench marks established by the United States Geodetic Survey between Whitehorse and the Alaska-Yukon boundary was also made.

The survey of the British Columbia-Yukon Territory boundary in the vicinity of the Alaska Highway was continued by the Legal Survey and Map Service, and several additional points established along the boundary line.

Work was also continued on a legal survey of the Alaska Highway in the Yukon Territory. During the season 187 miles of highway were surveyed, bringing the work to Whitehorse. A settlement survey was also made at Teslin, and other legal surveys were made. A traverse survey of the Alaska Highway in British Columbia was completed by a land surveyor of the Lands, Parks and Forests Branch.

Two parties from the Geological Survey of Canada, Mines and Geology Branch, completed reconnaissance work along the Alaska Highway and Canol Road respectively. The survey along the highway extended west and northwest from Whitehorse and included areas north and northwest of Kluane Lake and southwest of Dezadeash Lake.

During July and August, 1945, a biological investigation of the waters in Yukon Territory was carried out by Professor V. C. Wynne-Edwards and Dr. Ronald Grant for the Fisheries Research Board of Canada. The party flew from Whitehorse to Porcupine and Peel Rivers in the northern part of the Territory, and also travelled the Yukon River from Whitehorse to Dawson by flat-bottomed boat. An examination of the main rivers and lakes in the southern part of the Territory was also made during the course of a trip by truck, which entailed more than 1,000 miles of travel. The investigation revealed that although commercial fisheries in the Territory are relatively poor, the sport fishery is capable of considerable development and is potentially a valuable asset in connection with future tourist traffic.

LAND REGISTRY

The Land Registry maintains a Central Office of Record for lands owned or otherwise controlled by the Dominion; it administers certain Ordnance and Admiralty lands, Dominion public lands, Soldier Settlement lands on which advances have been made, and Dominion lands reserved to Canada under the Transfer of Natural Resources Agreements. The Land Registry also, in conjunction with the western provinces, considers applications for apportionment or adjustment of seed grain, fodder, and relief indebtedness, whether advanced solely by the Dominion or jointly by the Dominion and provinces; issues Letters Patent; and administers matters in connection with the purchase of lands acquired for the Alaska Highway, and with mineral rights reserved by virtue of Section 57 of the Soldier Settlement Act.

Central Office of Record

The Central Office of Record is a convenient inventory of all lands owned or otherwise controlled by the Dominion, and the general public and other departments have found it a ready source of information. A complete list of properties controlled by the other departments had not been received at the outbreak of war, and owing to the pressure of war work and the great number of new properties acquired during the war, the records are not entirely up-to-date. It is hoped, however, that this situation will be remedied in the near future. There are 6,439 parcels listed.

Ordnance and Admiralty Lands

Ordnance and Admiralty lands are those areas in the Maritime Provinces, Quebec, Ontario, and British Columbia which were at one time, because of their strategic situation, reserved or acquired by purchase or otherwise by the Crown. When no longer required for such purposes they are transferred to this Department to administer. It is the policy of this division to make these lands revenue-producing wherever possible, by placing them under occupation in the manner to which they are best suited. The work of administration comprises appraisals, surveys, searches of titles, the preparation of plans, leases, and reports, and the collection of rentals.

During the year there were 13 investigations and 5 surveys carried out, covering parcels of land in Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia. The Port McNeil Government Reserve was transferred from

the Department to the Province of British Columbia. No lands were transferred to the Department. One hundred and one leases and 3 permits were issued and 17 sales were completed. The net revenue from Ordnance and Admiralty lands for the year was $26,670.07.

Public Lands

Lands of other departments no longer required for the purpose for which they were obtained are transferred to the Department as public lands, and put on a revenue producing basis where possible.

During the year 10 investigations were made, no lands were transferred to the Department and 5 parcels were sold. The net revenue for the year from public lands amounted to $88,594.

Soldier Settlement Charged Lands

The unpatented lands in the four western provinces, against which charges are registered under the Soldier Settlement Act, remain vested in the Dominion. There are 104 quarter-sections comprising approximately 16,640 acres thus administered. They are divided among the four western provinces as follows: Manitoba, 10 parcels; Saskatchewan, 42 parcels; Alberta, 32 parcels; and British Columbia, 4 parcels.

Letters Patent are issued to entrants who complete the required duties in accordance with the terms of the Dominion Lands Act, if their indebtedness to the Soldier Settlement has been liquidated. If their duties are complete but this indebtedness still unpaid, Letters Patent are issued in the name of the Director, Soldier Settlement of Canada, under the authority of the provisions of Section 27 of the Soldier Settlement Act, and the amendment of 1931. During the fiscal year 7 Letters Patent were issued, 2 in the name of the Director, Soldier Settlement of Canada, and 5 in the name of the entrants.

Timber and Grazing Within the Provinces

Timber.—There are 11 licensed timber berths covering a total of 61·212 square miles within the boundaries of the National Parks. Two of these berths are in the Province of Manitoba and 9 are in British Columbia. During the year licences, in duplicate, were issued for each berth—the revenue amounted to $3,721.15.

On the Dominion Government Coal Block, near Hosmer, B.C., there is one timber berth permit in force.

Timber cutting operations continued active on Ordnance Reserve No. 1 and Naval Reserve A on St. Joseph Island in Lake Huron and the revenue collected was $149.54.

Grazing.—During the year 10,054·9 acres were covered by 6 annual grazing permits on Dominion lands along the southern boundary of Saskatchewan and Alberta and sworn returns by the permittees indicated that for the grazing season 1945, there were 497 cattle, 173 horses, and 400 sheep maintained on the lands. The revenue, consisting of ground rental, amounted to $179.20.

Seed Grain, Fodder, and Relief Indebtedness

During the year, recommendations relating to the adjustment or apportionment of outstanding seed grain, fodder, and relief indebtedness were submitted in 1,641 cases by the Alberta, Saskatchewan, and Manitoba Adjustment Boards. These recommendations were ratified by Orders in Council and 2,116 discharges and releases of liens were issued. As a result, indebtedness amounting to $187,043.97 was written off. There were 2,862 inquiries from the provinces for

statements of outstanding indebtedness relative to the issue of land grants, and 221 certificates of indebtedness were issued. In addition, 5,743 inquiries were received from different Debt Adjustment Boards in the western provinces. Gross collections for the fiscal year amount to $115,358.67 and the sum of $3,165.60 was refunded, leaving a net revenue of $112,193.07.

As the staff engaged on this work has other responsibilities as well, it is impossible to give a definite figure for the cost of administration but the total amount including office expenses and field investigations is approximately $7,000.

The following summary shows the financial operations for the year ended March 31, 1946:

	Principal	Interest	Total
Debits			
Balance outstanding March 31, 1945	$2,525,263 99	$3,613841 15	$6,139,105 14
Accrued interest April 1, 1945 to March 31, 1946		144,378 86	144,378 86
Total debits	$2,525,263 99	$3,758,220 01	$6,283,484 00
Credits			
Net revenue April 1, 1945 to March 31, 1946	$ 72,916 74	$ 39,276 33	$ 112,193 07
Amount written off as loss by Orders in Council (Sec. 1, Chap. 51, 17 George V)	45,435 70	141,608 27	187,043 97
Total credits	$ 118,352 44	$ 180,884 60	$ 299,237 04
Amount outstanding March 31, 1946	$2,406,911 55	$3,577,335 41	$5,984,246 96

SUMMARY

Province of Manitoba

	Principal	Interest	Total
Debits			
Amount outstanding March 31, 1945	$ 11,059 24	$ 17,099 03	$ 28,158 27
Accrued interest April 1, 1945 to March 31, 1946		583 10	583 10
Total debits	$ 11,059 24	$ 17,682 13	$ 28,741 37
Credits			
Net revenue April 1, 1945 to March 31, 1946	$ 448 71	$ 285 21	$ 733 92
Amount written off as loss by Orders in Council	51 00	352 62	403 62
Total credits	$ 499 71	$ 637 83	$ 1,137 54
Amount outstanding March 31, 1946	$ 10,559 53	$ 17,044 30	$ 27,603 83

Province of Saskatchewan

	Principal	Interest	Total
Debits			
Amount outstanding March 31, 1945	$1,633,945 72	$2,282,109 42	$3,916,055 14
Accrued interest April 1, 1945 to March 31, 1946		92,555 42	92,555 42
Total debits	$1,633,945 72	$2,374,664 84	$4,008,610 56

Credits			
Net revenue April 1, 1945 to March 31, 1946	$ 56,998 77	$ 34,727 15	$ 91,725 92
Amount written off as loss by Orders in Council	14,241 69	66,112 80	80,354 49
Total credits	$ 71,240 46	$ 100,839 95	$ 172,080 41
Amount outstanding March 31, 1946	$1,562,705 26	$2,273,824 89	$3,836,530 15

Province of Alberta

	Principal	Interest	Total
Debits			
Amount outstanding March 31, 1945	$ 880,234 03	$1,314,595 20	$2,194,829 23
Accrued interest April 1, 1945 to March 31, 1946		51,239 09	51,239 09
Total debits	$ 880,234 03	$1,365,834 29	$2,246,068 32
Credits			
Net revenue April 1, 1945 to March 31, 1946	$ 15,469 26	$ 4,263 97	$ 19,733 23
Amount written off as loss by Order in Council	31,143 01	75,142 85	106,285 86
Total credits	$ 46,612 27	$ 79,406 82	$ 126,019 09
Amount outstanding March 31, 1946	$ 833,621 76	$1,286,427 47	$2,120,049 23

Province of British Columbia

	Principal	Interest	Total
Amount outstanding March 31, 1946	$ 25 00	$ 38 75	$ 63 75

Letters Patent

During the fiscal year there were 12 Letters Patent issued covering a total of 1,026 acres, divided according to provinces as follows:—

	Patents	Acres
Saskatchewan	6	863
Alberta	2	161
Northwest Territories	2	2
Yukon Territory	2	0
	12	1,026

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

	Homesteads* Patents	Homesteads* Acres	Soldier* Patents	Soldier* Acres	Special† Patents	Special† Acres	Sales Patents	Sales Acres
Saskatchewan	1	160	4	639	1	64		
Alberta	..	...	..	...	1	160	1	1
Northwest Territories	..	...	..	...	..	...	2	2
Yukon Territory	..	...	..	...	..	...	2	0
Total	1	160	4	639	2	224	5	3

*Under this heading are included lands entered for by returned soldiers, affected by loans from the Director of Soldier Settlement of Canada, said loans having been repaid in full. Patents were issued direct to the settlers.

†Under this heading are included lands entered for by returned soldiers affected by loans from the Director of Soldier Settlement of Canada, which loans were patented to the said Director either at the request of the entrants or pursuant to salvage proceedings under the Soldier Settlement Act.

There were 237 certified copies of Letters Patent issued during the fiscal year, for which the Department received $740.

Alaska Highway Land Acquisition

The survey of the right of way of the Alaska Highway in British Columbia was completed during 1945, and draughting of the plans is now under way.

There were 10 parcels of land purchased during the year, comprising approximately 279·18 acres. One new lease was entered into, covering 14·5 acres for nuisance ground at Dawson Creek, and 6 leases were terminated. One hundred and thirty-one easements were acquired, covering a waterline to Fort St. John aerodrome, another to Dawson Creek campsite, and telephone and telegraph lines in Alberta and British Columbia. The title on three quarter-sections of land on the Dawson Creek flight strip, one lease at Dawson Creek, and one at Fort St. John were transferred to the Department of Transport.

Eighteen parcels of land comprising 325·27 acres have yet to be purchased, but owing to the difficulty of locating the respective owners there may be some delay in accomplishing this.

NATIONAL PARKS BUREAU

Mention of World War II is inevitable because both its continuance during part of the year under review and its victorious conclusion had a significant effect upon National Parks operations. While travel restrictions in the United States during the war, as well as the shortage of tires and gasoline, severely curtailed the number of American tourists, the percentage of Canadian visitors to the parks was greater than ever. Such a trend in the recreational habits of Canadians is worth noting now, as its development may be more evident in the years ahead.

War conditions and their aftermath also curtailed expenditures for park maintenance and improvements. Because of the shortages of man-power and equipment, and the pressing need for both men and materials, particularly in house-building projects, expenditures on both maintenance and improvements were kept down to a level consistent with the protection of the National Parks in which the people of Canada have already invested some forty-five million dollars. Nevertheless, plans for greater development, in keeping with the growing use of these parks, were advanced to the point where they can be readily carried out when men and materials are available.

The dramatic ending of the war had an almost immediate effect upon the attendance figures at the National Parks. From the previous year's total of 457,392 visitors the figures climbed to 602,409. It is worthy of note that more than 93 per cent of the 1945-46 visitors to the National Parks were Canadians.

National Parks

	1945-46	1944-45
Banff	148.113	119,065
Cape Breton Highlands	18,863	11,940
Elk Island	24.939	14,881
Georgian Bay Islands	3.842	4,290
Glacier	330	345
Jasper	16,127	12,497
Kootenay	28,326	17,113
Mount Revelstoke	6,474	3,745
Nemiskam	....	17
Point Pelee	59,948	38,745
Prince Albert	18,858	13,059
Prince Edward Island	48,068	33,365
Riding Mountain	108,060	88,096
St. Lawrence Islands	10,809	10,547
Waterton Lakes	46,744	37,278
Yoho	10,868	6,663

National Historic Parks

Fort Anne	5,544	7,369
Fort Beausejour	5,343	3,344
Fort Chambly	16,203	14,674
Fort Lennox	655	....
Fortress of Louisbourg	3,126	2,617
Fort Malden	15,279	12,978
Fort Wellington	2,594	2,568
Port Royal Habitation	3,296	2,196
Totals	602,409	457,392

Administration

The parks are administered by the National Parks Bureau at Ottawa under the authority and provisions of the National Parks Act. The Act also covers the National Historic Parks, places set aside to commemorate historic events or to preserve national sites and monuments. Besides the administrative staff at Ottawa, a resident Superintendent is located in each of the principal parks. In addition to the protection and management of wildlife within the park areas the National Parks Bureau at Ottawa administers the Migratory Birds Convention Act.

EVENTS OF INTEREST

Principal events of interest in the parks during the fiscal year 1945-46 are noted briefly hereunder:

April was the peak month for skiers, who came from all parts of the continent to the lodges in Banff National Park. There was a greater snowfall in April than in any month during the winter, and skiers visited Mount Norquay as late as the last Sunday in the month. Annual ski camp of the Alpine Club of Canada was held in the Little Yoho Valley.

Delegates to the Navy League of Canada convention, held in Calgary, spent April 27 at Banff, and a Dominion convention of Compensation Board officials was held in Banff from May 21 to 24, as well as the district conference of Kinsmen Clubs from May 25 to 27.

About one hundred naturalists and bird lovers spent a week-end in Point Pelee National Park studying birds.

His Excellency the Earl of Athlone and Her Royal Highness Princess Alice spent five days, May 5 to 9, in Jasper National Park visiting many points of interest.

The Order of the Eastern Star convention was held in Banff National Park on June 5. Later June events at Banff included a visit by a group of Belgian journalists and a Lions Club convention June 13, and a meeting of the Canadian Youth Hostels Association on June 18.

A group of forty-four convalescent sailors and staff members from the Farragut Naval Hospital near Sandpoint, Idaho, spent two nights at Radium Hot Springs en route to Banff and Lake Louise.

The Trail Riders of the Canadian Rockies held their annual outings in Banff National Park during July, and on July 31 the French Ambassador to Canada, Comte de Hauteclocque, visited Banff.

The Wasagaming Golf Club's annual tournament was held in Riding Mountain National Park.

Prince Albert National Park was the scene of the Saskatchewan Tennis Championships on July 1 and 2.

The Alpine Club of Canada held camp in the Eremite Valley, Jasper National Park.

"The Mazamas", a mountaineers' club with headquarters in Portland, Oregon, held their annual encampment at Lake O'Hara, Yoho National Park, between July 16 and July 29, and the following month the Skyline Trail Hike was held in the same park, August 3 to 6.

Thirty-two patients of a United States Army hospital in Spokane, Washington, came to Banff as guests of the local Rotary Club.

Point Pelee National Park was visited on August 26 by a delegation from the Point Pelee Nature Laboratory, Detroit, Michigan.

Golf Tournament Week was held in Prince Albert National Park, Saskatchewan, from August 12 to August 18.

The Prince Edward Island Golf Association held the finals of the Provincial Tournament at the Green Gables links on August 22. Sixty-two players participated in the tourney.

Hon. Ray Atherton, United States Ambassador to Canada, spent the period between August 3 and August 19 visiting points of interest in Jasper National Park with a party of friends.

Held on August 5-6, the annual golf tournament sponsored by the Lions Club drew 220 entries to Waterton Lakes National Park. On V-J Day War Correspondent Matthew Halton, formerly of Pincher Creek, Alberta, was guest of honour at a gathering sponsored by the Waterton Park Lions Club.

The Banff School of Fine Arts completed its thirteenth intensive summer session in August. Four hundred and twenty-seven students were registered.

A 26-inch snowfall during the last week of October resulted in a record early opening of the ski season at Mount Norquay in Banff National Park. The famous Banff Winter Carnival opened on December 26 and continued with a series of week-end events until March, being concluded with the crowning of the "Carnival Queen". A marked increase in entries for the annual Banff Bonspiel during the week beginning February 11 was noted, and the Ski Runners championships at Mount Norquay drew at least 1,500 spectators. Three hundred and twenty-five skiers from Edmonton visited Banff on March 17.

PUBLIC RELATIONS

Publicity, during the war years, was directed toward making the people of Canada more aware of the wonderful heritage they possess in their National Parks, to create a greater pride in the possession of these nationally-owned playgrounds, and to acquaint the public with the recreational and inspirational values of the parks from the standpoint of health and morale. The results indicate a fair measure of success.

The principal channels through which the public was approached were: (*a*) public addresses at conventions and other gatherings, (*b*) the distribution of articles, mats, photographs, and engravings to newspapers and magazines, and (*c*) the distribution of booklets, folders, slides, and films.

Addresses were delivered during the year to several organizations interested in travel in Canada, and special articles descriptive of the scenic attractions, wildlife, and recreational facilities in the National Parks were regularly supplied to newspapers and to magazines desiring them. Forty-seven articles, many of them written in editorial style, were released to the press. More than 600 press clippings attest to the wide coverage which these articles received, due largely to the favourable attitude of editors to the National Parks idea. To illustrate these articles 211 mats and 188 cuts were sent out. A total of 1,138 photographs were also supplied, as well as 154 enlargements of National Parks scenes. Text material was supplied for use in annual publications and encyclopedias and by writers, publicists, and lecturers. Twenty-five copies of each article in English and ten in French were forwarded to the Canadian

Information Service for distribution to Canadian offices abroad. Where practicable, articles are translated into the French language for use in the French press in Canada and the United States. A feature of this year's newspaper publicity has been the increase in the number of articles used editorially.

Distribution of National Parks literature totalled 132,240 pieces as follows:

Canada's Mountain Playgrounds	9,625
Fort Anne Guide	9,000
Jasper Park folder	20,945
Kootenay-Yoho folder	6,995
Playgrounds of Eastern Canada	5,260
Playgrounds of the Prairies	11,075
Waterton Lakes folder	7,195
Banff folder	17,745
National Parks folder	10,120
Cape Breton Highlands folder	5,000
Riding Mountain booklet	5,500
Riding Mountain folder	10,445
Prince Albert folder	4,125
Fort Wellington Guide	1,000
Elk Island booklet	2,850
Prince Edward Island folder	1,000
Geology of National Parks	575
Birds of Banff Park	75
Elk Island folder	3,710

Motion pictures from the Bureau library, covering a variety of recreational and nature-study subjects, were lent to many organizations requesting them. In this manner 2,441 films were distributed and at the 9,506 showings at least 804,070 persons were reported as having seen them. In addition, 2,183 lantern slides were provided for a similar service.

The announcement by the Prime Minister that the name of Castle Mountain had been changed to Mount Eisenhower, in honour of General Dwight D. Eisenhower, gave added publicity to the National Parks and resulted in many requests for articles and photographs relating to this famous mountain.

While the value of Canada's National Parks as wildlife museums and conservation areas has been constantly stressed, the importance of the parks to the tourist industry of Canada has also been emphasized. The average inquirer appears to be more interested in the facilities for recreation and accommodation, the condition of the roads to and in the parks, and the quality of the catering service than in the part which the parks are playing in conserving the natural phenomena, the flora and fauna, and the superb scenery in these areas. Any new development for the comfort and convenience of park visitors is, therefore, publicized in a matter-of-fact manner without exaggerated claims or extravagant comparisons. A series of articles calling attention to the camping facilities which are provided in the parks was released during the latter part of the year in order to increase the use of these camp-grounds and relieve the pressure on existing accommodation. It is expected that the results of this publicity campaign will be apparent during the 1946 tourist season.

DIRECT REVENUE

Gross revenues from the National Parks and from the administration of the Migratory Birds Convention Act for the fiscal year 1945-46 amounted to $302,725.89 and $462.46 respectively, a total of $303,188.35. Compared with the figures for the previous year, which were $288,537.31 and $228.84 respectively, an increase of $14,422.20 is indicated.

MAINTENANCE AND IMPROVEMENTS

Maintenance was carried out as economically as possible on all facilities, including highways, roads, trails, bridges, and buildings. Within the townsites, municipal services were continued on a repayment basis.

Roads and Bridges

The only construction under this classification was a new concrete bridge over Sinclair Creek at Mile 5·2 in Kootenay Park. Steel girders were placed at the Kicking Horse River bridge in Yoho on concrete abutments already in place. A new culvert was built on the Trans-Canada Highway west of Banff, and a cable guard-rail, 3,400 feet in length, was erected along the road over the dam at Lake Minnewanka.

Practically all road work carried out was for maintenance and improvement of existing facilities, and consisted of widening, grading, and surfacing, together with extensive repairs to bridges and culverts.

Trails

Extensions totalling 8·75 miles were carried out on trails in Banff Park, but elsewhere the work consisted of maintenance only.

Communication Systems

No construction work was done on telephone lines except in Jasper Park, where a right-of-way was cut to the Palisades and the line completed to the lookout. Maintenance work on communication systems was carried out generally in all the parks, and in several of them radio-telephone sets are in use.

The following table indicates the existing mileage of roads, trails, and telephone lines within the National Parks as at March 31, 1946:

National Parks	Roads				Trails	Telephone Lines
	Motor	Secondary	Fire	Total		
	miles	miles	miles	miles	miles	miles
Banff	182·4	10·5	94·5	287·4	743·55	273·0
Cape Breton Highlands	50·8	1·6	.....	52·4	21·0	.....
Elk Island	16·0	.....	.....	16·0	14·0	16·0
Glacier	.....	.....	20·5	20·5	91·0	1·5
Jasper	144·0	18·5	34·7	197·2	590·1	414·2
Kootenay	61·1	.....	9·5	70·6	155·2	60·0
Mount Revelstoke	18·0	.....	.....	18·0	33·5	10·7
Point Pelee	6·5	2·8	.....	9·3	.....	.....
Prince Albert	68·0	43·0	163·0	274·0	236·5	134·0
Prince Edward Island	7·1	2·5	.....	9·6	.....	.....
Riding Mountain	51·6	52·9	.....	104·5	113·0	149·0
Waterton Lakes	47·8	13·5	12·0	73·3	159·4	60·2
Yoho	46·0	6·5	25·0	77·5	191·0	69·5
Total	699·3	151·8	359·2	1,210·3	2,348·25	1,188·1

Buildings

New construction consisted mainly of repairs, improvements or extensions to existing buildings, but a few minor buildings and structures were erected. Building permits were issued as follows: Banff Park 91, Jasper Park 15, Riding Mountain Park 23, and Waterton Lakes Park 15.

Construction work included an equipment depot, Minnewanka Lake wharf; a milk depot for Tunnel Mountain camp-ground; two water-storage tanks at Sulphur Mountain and Cascade River respectively; and a warden's cabin at Bryant Creek, all in Banff Park. In addition, a warden's cabin at Goat Creek was started, and one at Stoney Creek was 50 per cent completed. In Jasper Park construction was in progress on a log building at Ranger Creek camp; in Glacier Park a new warden's cabin was erected in Flat Creek district; and in Kootenay Park alterations and repairs were made to the Administration buildings. New ice and meat houses were built at Radium Hot Springs, and a gravity water supply was installed for Hay cabin. An implement shed at Mile One was completed and a water storage tank erected at Mile Two. In Yoho Park a warden's cabin with gravity water supply was built at Wapta Lake, and a frame building was erected at Misko camp. In all other park building operations were confined to repairs and maintenance, although at Cape Breton Highlands Park the Provincial Government erected an addition to Keltic Lodge as well as eight separate staff buildings in connection with the lodge.

Townsites

At Banff, municipal services and maintenance were carried out. At Jasper, in addition to the above, a new water supply intake was installed at Cabin Lake, and sewer services were laid to three new houses. The water supply at Jasper serves both the townsite and the Canadian National Railways, and average daily consumption amounted to 631,433 gallons. At Kootenay, in addition to maintenance and repairs, the Radium Hot Springs water system was extended 1,500 feet to McKay Creek in order to obtain a purer supply. At Waterton, a new electric generating plant of 60 kva. was installed and has been working satisfactorily. At all other parks maintenance and repairs were the only activities carried on.

Forest Protection

The fire season of 1945 was one of the most favourable that has been experienced in the National Parks in the last ten years. Only 19 forest fires occurred, burning over an area of approximately 153 acres. The nearest approach to this was in 1943, when 23 fires were reported with a burned area of 5,492 acres.

One notable feature of the past season was the small number of fires in the "prairie" parks—only two in Prince Albert Park, and none in Riding Mountain Park. These parks are located in areas of high hazard, and were responsible for most of the larger fires during the dry years of 1939 and 1940.

An analysis of the causes of these fires shows that lightning was responsible for 47·3 per cent; campers and smokers, 21 per cent each, and miscellaneous known causes 10·7 per cent. Classified according to size, 47·3 per cent were less than ¼ acre; 47·3 per cent, ¼ to 10 acres; and 5·4 per cent, 10 to 500 acres. The value of timber burned, which was estimated at $188.40, was extremely low.

Fire Losses in National Parks

Park	Number of Fires		Area Burned—Acres		Cost of Suppression	
	1945	1944	1945	1944	1945	1944
					$ cts.	$ cts.
Banff	4	5	2¼	3½	69 52	20 38
Cape Breton Highlands	1	0	4	0	142 77	0 00
Elk Island	1	0	spot	0	5 00	0 00
Glacier	2	0	131	0	351 92	0 00
Georgian Bay Islands	0	0	0	0	0 00	0 00
Jasper	1	0	9½	0	4 25	0 00
Kootenay	3	2	4½	5	132 67	36 12
Mount Revelstoke	3	0	1¾	0	483 28	0 00
Point Pelee	0	7	0	102	0 00	18 58
Prince Albert	2	8	½	1,215½	70 00	1,278 68
Prince Edward Island	0	0	0	0	0 00	0 00
Riding Mountain	0	5	0	1,937	66 63	264 54
St. Lawrence Islands	0	2	0	½	0 00	0 00
Waterton Lakes	2	0	spot	0	2 50	0 00
Yoho	0	0	0	0	0 00	0 00
Totals	19	29	153½	3,263½	1,328 54	1,618 30

Improvement in Fire-Fighting Equipment

The only new forest fire lookout completed during the year was the Palisades cabin in Jasper Park. The total number of primary lookouts in the mountain parks is now twelve.

Purchases of new equipment were limited almost entirely to replacements and repair parts necessary to maintain the efficiency of the fire-fighting organization. One new 1,000-gallon tank truck was constructed by the warden service in Banff and proved very successful in the control of fires along the highways.

Fire Weather Forecasting

Fire weather recording stations were in operation throughout the fire season in Banff, Jasper, Yoho, Waterton Lakes, Prince Albert, and Riding Mountain Parks. Although weather conditions were generally favourable, short periods of extreme hazard occurred in May and June and again in September and October. No new weather stations were established during the year.

Insect Control

Measures to control the mountain pine bark-beetle (Dendroctonus monticolae) were limited to salvage operations in Kootenay Park and treatment of an area of active infestation near Leanchoil in Yoho Park. In the latter, fifteen men were employed from early in January until the end of March, 1946. During this period an area of some 280 acres was blocked out, and infested trees were marked and destroyed by burning. Because of labour difficulties and an unusually heavy snowfall, the work was not completed and will have to be continued next autumn.

In Kootenay Park, salvage operations in beetle-killed lodgepole pine were conducted on both sides of the Banff-Windermere Highway near Miles 16 and 21. Alternative service workers carried on logging and milling operations which produced approximately 280,000 feet board measure of lumber and 9,302 linear feet of mine props.

Disposal of Timber Under Annual Cutting Budget

Cutting of saw-timber, fuel-wood, and other forest products for the use of local settlers under the annual budget plan was continued in Riding Mountain Park. During the period from April 1, 1945, to March 31, 1946, 2,090 permits were issued for 3,074,755 feet board measure of saw-timber, 20,541 cords of fuel-wood, 65,860 posts, and 7,290 trees. Permits issued during the current year showed a marked decrease from the year 1944-45 when the number was unusually high as a result of the large quantity of windfalls caused by severe storms.

Use of Alternative Service Workers

In the spring of 1941, under the authority of the National War Services Regulations, Mennonites and other conscientious objectors exempted from military training were required to perform alternative service. On December 1, 1942, administration of alternative service, which up to that time had come under the Department of National War Services, was transferred to the Department of Labour.

Camps, which were first established in Banff, Jasper, Kootenay, and Riding Mountain National Parks in 1941, continued to operate throughout the past fiscal year. Early in May, twenty-four men were transferred from Kootenay Park to Yoho Park, where they operated as a separate unit until the end of September. As in former years accommodation was provided by the use of permanent camp buildings, portable huts, and tents. Supervisory personnel and skilled labour were hired by the Superintendent as required, and were paid at prevailing rates. Ordinary workers were paid at the rate of 50 cents a day, which could be increased to 75 cents for those promoted to sub-foremen, and $1.00 for foremen. In addition board, lodging, clothing, and medical and dental care were provided free. Workers were also entitled to receive benefits under the Government Employees Compensation Act.

During the 12-month period ended March 31, 1946, 456 conscientious objectors were employed in these camps. Of these 258 were transferred to agriculture and industry, 15 were discharged as medically unfit, and 5 deserted.

Work projects upon which these men were employed consisted mainly of forest protection, forest fire suppression, construction and maintenance of fire trails, buildings, telephone lines, roads, bridges, and culverts, general improvement to park property, and salvage of insect-killed, fire-killed, and wind-thrown timber. Products from these operations included 570,000 board feet of sawn lumber, 9,302 linear feet of mine props, 9,655 board feet of sawlogs, 439 cords of fuel-wood, 100 telephone poles, 260 hub rails, and 2,000 fence-posts. In addition, 3,112 cubic yards of gravel was hauled and spread, and 1,400 feet of secondary road, 175 feet of hub rail, and 17 culverts were constructed.

Fewer men were employed than last year, and as a result of transfers to agriculture and industry the total strength in all camps was reduced to about 100 by the middle of January, 1946. Although there were some exceptionally good workers, the majority of the men were of inferior quality who had been brought to camp under escort for refusing to accept work elsewhere. Although this combination of circumstances tended to slow up the return per man-day, much useful work was completed which would not have been possible under the regular appropriations available.

NATIONAL HISTORIC PARKS AND SITES

The functions of the National Parks Bureau include the restoration, preservation, marking, and administration of National Historic Parks and Sites and the commemoration of the public services of outstanding personages connected with the civil and military history of the Dominion. In this phase of its work the Bureau is advised by the Historic Sites and Monuments Boards of Canada, an honorary body of recognized historians representing the various parts of the country.

The personnel of the Board is as follows: Chairman, Dr. J. Clarence Webster, Shediac, New Brunswick; Professor Fred Landon, London, Ontario; Professor D. C. Harvey, Halifax, Nova Scotia; Hon. E. Fabre-Surveyer, Montreal, Quebec; J. A. Gregory, North Battleford, Saskatchewan; Rev. Antoine d'Eschambault, St. Boniface, Manitoba; Major G. Lanctot, Dominion Archivist, Ottawa, Ontario; Professor M. H. Long, Edmonton, Alberta; Professor Walter N. Sage, Vancouver, British Columbia; W. D. Cromarty, National Parks Bureau, Ottawa, Ontario.

A general meeting of the Board was held in Ottawa, May 16-18, 1945, when many subjects relating to the historic background of the Dominion were reviewed and an additional number of sites selected to be marked by the Bureau at a later date. Of the many sites already considered by the Board, 352 have now been marked or acquired and 202 recommended for attention at a later date.

National Historic Parks

Fort Anne National Historic Park, Annapolis Royal, Nova Scotia.—The museum building, bandstand, cannon, flagpole, benches, and chain fence were painted, the roads and lawns properly maintained and the edges trimmed and a number of the electric light posts in the park were moved to other locations in

order to improve the lighting conditions. An underground drain was laid from the west side of the museum building to the moat. Many additional articles of historical interest were acquired.

A total of 5,544 persons signed the museum register during the year.

Port Royal National Historic Park, Lower Granville, Nova Scotia.—Several pieces of furniture were made and placed in the Governor's Chambers; preserving fluid was applied to the outer walls of the Habitation; the Coat-of-Arms over the main entrance was cleaned and varnished; the doors were painted and all iron work cleaned and oiled; the bridges were repaired; fresh gravel was placed in the powder magazines and the lawns were rolled, fertilized and maintained.

The Minister of Game and Fisheries for the Province of Quebec kindly arranged for four wolf skins to be sent to the park and these are now on display at the Habitation.

Visitors registered in the park during the year numbered 3,296.

Fortress of Louisbourg National Historic Park, Louisburg, Cape Breton Island, Nova Scotia.—The damage to the entrance road caused by a tidal wave was repaired; a new woven wire fence was erected along the western boundary of the park; the lawns and paths were kept in good condition; bridges within the park area were repaired; the iron fence enclosing the Society of Colonial Wars memorial was scaled and painted; the entrance gates, field signs, and all storm doors and windows were painted and several of the rooms in the basement re-decorated.

A memorial erected by the Congregation of Notre Dame on the site of the convent to the members of the Order who served at the fortress during the period it was occupied by the French was unveiled on August 25.

A total of 3,126 persons signed the visitors' register.

Fort Beausejour National Historic Park, Sackville, New Brunswick.—New signs were made and erected throughout the park to mark points of interest, the larger ones being placed on heavy posts set in concrete; the roads and paths were cleaned and trimmed; the walls of the furnace room were treated with a special cement preparation and the guns and gun carriages painted. The Coat-of-Arms of H.M.C.S. *Whitby* and *Moncton* were obtained from the Department of National Defence (Navy) and are on display in the museum.

Visitors registered during the year numbered 5,343.

Fort Chambly National Historic Park, twenty miles southeast of Montreal, on the Richelieu River.—The walls of the fort were repointed; the memorials within the fort grounds were cleaned; the caretaker's residence and the interior of the museum were redecorated, the flagpole, picnic tables and storm doors were painted, and the trees, shrubs, and paths trimmed.

During the year 16,203 persons signed the museum register.

Fort Lennox National Historic Park, Ile-aux-Noix, thirteen miles south of St. Johns, Quebec.—Permission was granted for the fort buildings to be used during the summer as a training centre for the Canadian Youth Association, sponsored by the Physical Fitness Division of the Department of National Health and Welfare. Two temporary buildings erected on the island during the period it was used as a refugee camp were disposed of by the War Assets Corporation and the water tank, also erected at that time, was taken down. The roofs of the guard house and officers' quarters were scraped and painted; the main entrance bridge was repaired; a new fire-pump was installed, and general maintenance work carried out on the fort buildings.

Visitors registered in the park during the year numbered 655.

Fort Wellington National Historic Park, Prescott, Ontario.—The wire fence enclosing the park property was removed; electric lights were installed in the underground passage leading to the caponniere; repairs were made to the palisades and to the drain from the septic tank; rubberized flooring was laid in the museum; a porch was constructed on the front of the officers' quarters now used as the caretaker's residence; the guard house was whitewashed, and the grounds were maintained in good condition. Additional articles of historical interest were obtained for the museum and a four-page leaflet was published containing a condensed version of the history of the fort.

A total of 2,594 persons signed the museum register during the year.

Fort Malden National Historic Park, Amherstburg, Ontario.—The boundary of the park has been extended to include an area immediately to the south on which a large residence known as "The Fort", and a smaller dwelling, known as "The Cottage", are situated. The latter is the only remaining building of the original Fort Malden. Many additional articles of interest relating to the early history of the district were received and are on display in the museum. The flagpole was painted and the lawns and paths were kept in good condition.

Fort Prince of Wales National Historic Park, Churchill, Manitoba.—General supervision was continued throughout the year.

National Historic Sites

During the year all the sites marked on the advice of the Board were suitably maintained. These include Indian earthworks, forts, and villages; French forts, trading posts, and mission enterprises; sites connected with British exploration and naval and military operations in the long struggle for the possession of Canada; posts of the Hudson's Bay Company and sites related to the social, economic, and industrial development of the country.

CONSERVATION SERVICES

Wildlife Management

The wildlife of the National Parks appeared to be generally in good condition after the average winter conditions of 1945-46. Dr. Ian McTaggart Cowan, Professor of Zoology, University of British Columbia, continued his scientific studies of the animal populations and range conditions of the mountain National Parks. In spite of the planned reduction in the number of elk during the previous winter, Dr. Cowan reported that the ranges of Banff and Jasper National Parks still showed signs of serious overgrazing. He recommended that the population of elk in these parks be further decreased next year. Plans have been laid for the reduction of elk in these parks, and the disposal of the dressed meat and hides to Indian reservations.

During the year marten and beaver were live-trapped in Banff National Park and given to the Indian Affairs Branch to restock areas that had been depleted. In order to maintain the high standard of our game stock by the weeding out of diseased animals, a close watch was maintained on the status of predators in the National Parks. It is necessary that the predators remain in balance with the hooved game mammals. In some cases it was found necessary to exercise some control on predators, especially on park borders in the vicinity of cultivated and stock-raising areas.

Wild Animal Parks

It was considered advisable to slaughter 400 buffalo in Elk Island Park during the year and the meat and hides were disposed of by tender. Eleven buffalo were slaughtered in Banff Park. The meat, with the exception of six carcasses, was given to the Indian Affairs Branch for use by the Indians. The

hides were sold by tender. Fifty-one buffalo were slaughtered in Riding Mountain Park, the meat and hides being sold by tender. Three buffalo were slaughtered in Prince Albert Park, one carcass being sold by tender and the remainder given to the Indian Affairs Branch. The hides were sold by tender. In order to protect the range from over-use, 352 surplus elk were slaughtered in Banff Park and 197 in Jasper Park. The meat and hides were given to the Indian Affairs Branch.

A census of wild animals in fenced enclosures in the National Parks as of March 31, 1946, is as follows:

ANIMALS IN FENCED AREAS

Species	Banff Park Paddock	Elk Island Park	Prince Albert Park Paddock	Riding Mountain Park Paddock	Total
Buffalo	6	896	7	25	934
Elk	.....	717	.....	168	885
Moose	.....	184	.....	.....	184
Mule deer	.....	72	.....	1	73
White-tailed deer	.....	.....	.....	14	14
Rocky mountain goat	1	.....	.....	.....	1
Total	7	1,869	7	208	2,091

FISHING AND FISH CULTURE

In general, fishing conditions in the National Parks of Canada continued to be satisfactory, judging by the many good catches reported to the park authorities. The use of Creel Census Cards in the mountain parks and in Prince Albert Park was continued, and 1,487 cards showing 2,970 efforts were returned. A new Creel Census Card was prepared, and every effort is being made to induce anglers to make the proper returns. A limnologist, appointed to the Bureau during the year, carried out preliminary investigations in some of the western parks in the autumn.

Fishing in Banff Park generally was considered to be only fair. Test netting was carried out at Lake Minnewanka to determine if the rainbow trout had become established in any reasonable numbers.

In Cape Breton Highlands Park some fairly good catches of trout were made in park waters. Extreme dry weather and low water during the fishing season did much to keep the catches down.

Stream fishing in Glacier Park was poor throughout the season, with a slight improvement noted during September.

The unusual weather conditions in Jasper Park affected the fishing throughout the season. The levels of the lakes were below those of the previous year. The long, cold spring weather affected both the spawning and the fishing. Fish cultural investigations were continued in many of the lakes in this park. The collection of trout eggs from park waters was carried out. During the year 82,000 speckled trout eggs were shipped to Banff Park.

Fishing generally throughout Kootenay Park, particularly in the Kootenay, Vermilion, and Simpson Rivers, was much better than it had been for some years.

In Mount Revelstoke Park fishing was good during the season, and some good catches were made, particularly in Lake of Jade.

Fishing in Prince Albert Park was not as good as in previous years, owing mainly to inclement weather. There were several long periods of bad weather when fishing was not possible. However, good catches of pickerel and pike were obtained from Waskesiu Lake. Commercial fishing for whitefish was again permitted to a limited extent in Waskesiu Lake during the summer.

A small number of excellent trout were taken from the Lake of Shining Waters and Long Pond, Prince Edward Island Park.

Fishing in Riding Mountain Park showed some improvement over past years, no doubt due to higher lake levels. During the autumn another shipment of approximately 318 mature lake trout was made to Clear Lake by rail and truck.

In Waterton Lakes Park pike fishing maintained its usual standard of attraction for the early fisherman, and reports indicate that returns were about the same as in other years. On the whole fishing conditions were satisfactory in this park.

Conditions in Yoho Park were fair and some good catches were reported.

The following statement shows the number of fry, fingerlings, and adult fish distributed in park waters during the year:

Park	Rainbow Trout	Cutthroat Trout	Speckled Trout	Lake Trout (adult)	Total
Banff	455,000	120,000	143,000	.....	718,000
Jasper	110,015	63,962	.....	.....	173,977
Kootenay	35,000	60,000	.....	.....	95,000
Waterton Lakes	80,900	82,000	.....	.....	162,900
Yoho	30,000	.....	.....	.....	30,000
Riding Mountain	.....	.....	.....	318	318
Total	710,915	325,962	143,000	318	1,180,195

MIGRATORY BIRDS CONVENTION ACT

The Migratory Birds Treaty, which was signed in Washington, D.C., on August 16, 1916, and made effective by Act of Parliament of Canada, 1917 (Chapter 130, Revised Statutes of Canada, 1927, and Amendments), was designed for the better protection of certain birds that migrate between Canada and the United States. In this conservation measure the Dominion and the provinces co-operate. Regulations in accordance with the Statute are agreed upon and are made effective by both the Dominion and the provinces.

The responsibility for the police work in connection with the enforcement of the provisions of the Migratory Birds Convention Act and Regulations thereunder throughout Canada was transferred to the Royal Canadian Mounted Police in 1932.

In 1945, the waterfowl situation in British Columbia remained practically unchanged. In the great duck-producing area of the Prairie Provinces, effects of serious drought conditions were noticed along the Alberta-Saskatchewan boundary and in the Athabaska Delta. These conditions contributed to a considerable reduction of the continental duck population. The ubiquitous and important mallard is the most numerous species. Mallards continued to concentrate locally in southern Alberta, causing trouble for agriculturists in some areas. In the East, the population of game ducks remained generally the same. For the first time in many years, the wood duck was legal game in Ontario. A considerable increase in the hunting of geese in the James Bay region was noted. No increase was evident in the population of greater snow geese. A cold summer apparently resulted in the production of very few young. In the Maritimes the spring migration of brant was encouraging, but the autumn flight was poor.

Only minor changes in seasons and bag limits were made in the Migratory Bird Regulations for the hunting of waterfowl and other migratory game birds. Close co-operation was continued with provincial governments, game conservation societies, and other organizations interested in bird conservation.

In the entire Dominion there are 754 honorary game officers, of whom 14 are officers of the Forest Service, 102 are officers of the Department of Fisheries, and 105 are Canadian Pacific Railway Police. The game and fishery officers of the Provinces of New Brunswick, Quebec, Ontario, Manitoba, and British Columbia and the members of the New Brunswick Provincial Police are ex-officio game officers under the Migratory Birds Convention Act.

Field administration of the Act was continued under the supervision of four District Migratory Bird Officers. The Chief Federal Migratory Bird Officer for British Columbia carried out an investigation of wildlife and other natural resources in central British Columbia. The Chief Federal Migratory Bird Officer for the Prairie Provinces made an intensive investigation of wildlife conditions in Wood Buffalo Park and other parks, and also made inspections of certain bird sanctuaries and public shooting grounds. The Chief Federal Migratory Bird Officer for Ontario and Quebec conducted a patrol and quinquennial census of eider ducks and other sea birds on ten sanctuaries in the Gulf of St. Lawrence. A motion picture film on the birds of the Gulf was produced. Wildlife investigations were carried on in other parts of Quebec, and in southwestern Ontario. The Chief Federal Migratory Bird Officer for the Maritime Provinces studied the unusually heavy invasion of snowy owls and continued his research on woodcock populations. Officers of the Bureau disseminated, by lectures and otherwise, information about migratory birds and their conservation, and lecture material, including motion pictures and lantern slides, was lent to voluntary assistants.

In order to proceed advantageously with adequate conservation of native wild birds as a natural resource of great economic value, it is indispensable that certain precise data be available for study by various officials and organizations charged with this responsibility. The only possible way in which much of the exact information required on the migration and general life histories of wild birds in their natural habitat may be obtained is by marking the birds with official numbered bands, bearing a return address, whereby each bird so marked may be clearly identified as an individual if it is later recaptured, killed, or found dead.

The importance and practical usefulness of this method of systematic investigation of wild bird life has been demonstrated and emphasized repeatedly for many years in most important international wildlife conservation discussions. Current ornithological and conservation literature contains much of the new and useful information made available through studies of data obtained as a result of bird-banding activities.

Bird banding in North America is international in scope and is being conducted, under the provisions of the Migratory Birds Convention Act and regulations thereunder, in full co-operation between the Wildlife Division of Canada's National Parks Bureau and the Fish and Wildlife Service of the United States Department of the Interior at Washington, D.C. Close co-operation with various provincial and state game authorities, as well as with game officials for Newfoundland and other North and South American countries, is also involved from time to time.

In Canada, where practically all banding activities are conducted voluntarily, and free of expense to this Department, by conservation-minded citizens, the National Parks Bureau has had jurisdiction over all banding investigations since 1923. During recent years, the number of voluntary co-operators in Canada has averaged about 200 per annum, all of whom furnish the National Parks Bureau with detailed records of all their banding operations. Wild birds may, of course, be banded only under authority of official permits, which are issued only to persons possessing certain ornithological ability, and none but the regular official bands, furnished free of charge to banding co-operators, may be used.

Bird banding in Canada continued to progress favourably during the period covered by this report. As of December 31, 1945, the Official Canadian Bird-Banding Records contained 478,232 records of birds that have been banded, together with a total of 32,874 detailed records of banded birds that have been recovered.

The National Parks Bureau appreciates the co-operation of all who have helped further the success of the bird-banding effort by reporting the recovery of banded birds, and urges all persons to report any banded birds which may come to their attention. Persons who report banded birds perform an act of direct benefit to the public at large in that they help advance scientific knowledge of wild birds as an important and very essential natural resource. No postage is required on reports relating to banded birds if they are directed to the Controller, National Parks Bureau, Ottawa, Ontario.

Sixty-five bird sanctuaries, comprising an area of approximately 1,291·08 square miles, are now reserved under the Migratory Birds Convention Act in Canada. One new sanctuary, Rockhill, in Quebec, was established during the period under review.

On some parts of the Atlantic Coast the eel-grass situation showed slight improvement, especially in Nova Scotia. However, normal conditions have not been restored anywhere on the Coast.

During the year 912 permits and licences were issued. Printed material distributed comprised 5,990 copies of the Migratory Birds Convention Act and Regulations, 14,802 Abstracts of the Regulations, 41,173 posters, and 7,789 educational pamphlets.

The Bureau was represented at the largely attended Eleventh North American Wildlife Conference in New York, March 11-13, 1946. A paper on the management of Canada's wildlife resources was presented and was well received.

DOMINION FOREST SERVICE

The year 1945 was notable for the cessation of nearly six years of war. In the Dominion Forest Service that event was marked by the gradual return of some 33 per cent of the professional and technical officers of the staff who had enlisted in the Armed Services. Considerable anxiety was felt with regard to the retention of forest engineers with long training and experience in the Forest Service. This situation developed as a result of the acute shortage of trained foresters in Canada and the consequent demand for their services by governments and industry. There is no doubt that this shortage will continue for some years and the supply of experienced and trained foresters will fall far short of satisfying increased demands throughout Canada. Fortunately, however, this difficulty was relieved in the Dominion Forest Service by a salary reclassification which, with a few exceptions, enabled the retention of the valuable technical forestry staff and also permitted the recruitment of additional experienced foresters.

In May, 1945, the Dominion Forester was loaned to the Department of Reconstruction as Deputy Co-ordinator, and subsequently as Acting Co-ordinator of Resources Development. The Assistant Dominion Forester was appointed Acting Dominion Forester.

The impact of the war on Canada's forests has been great. War needs made a tremendous demand on the forest resources of this country with the result that overcutting has occurred in many sections and serious depletion has taken place in the accessible stands of saw-timber, particularly in those producing the higher grades of lumber. Post-war needs will place an added burden on our forests to supply both the domestic and foreign requirements in the reconstruction period.

In addition to the past and future drain on timber supplies through cutting, other forms of forest depletion, such as fires, insects, and disease, leave little cause for comfort. Forest fire losses were considerably less than average for the past ten years but the fire season of 1944 was one of the worst on record. This clearly indicates that the forest fire protection situation in Canada to-day is unsatisfactory since the toll of loss and damage through this agency varies mainly with the weather conditions.

Losses due to forest insect epidemics and tree diseases are on the increase. In particular, the present epidemic of spruce budworm, if not controlled, threatens the loss of raw materials on a scale approaching national disaster. To combat this immediate menace the Forest Insect Control Board was set up in September, 1945, with representation from the Departments of Mines and Resources, Agriculture, and Reconstruction and Supply, and from British Columbia, Ontario, Quebec, and the Maritime Provinces. Through the actions of this Board increased funds have been made available by the Federal Government and plans have been drawn with a view to finding measures to control the spruce budworm and other forest insects, particularly in the endemic stage.

The forest resources of Canada are immense in size and diversified in character but they are not inexhaustible. If Canadians are to attain the full benefit of this great natural heritage our forest land must be brought into a state of continuous production. Liability to destruction by fire, insects, and disease must be controlled and forests managed as perpetually renewable crops.

To the problem of improving the protection and management of our forests must be added problems concerning the more efficient use of wood that is cut and there must be constant effort to improve the efficiency of the forest products industries themselves. The Forest Products Laboratories of this Department have made and are continuing to make a substantial contribution in this effort.

The key to forestry progress in Canada lies in co-operation among the parties most immediately interested, namely, industry, the provincial governments, and the Dominion Government. Each of these agencies must be prepared to assume definite responsibility if our forests are to yield all the economic benefits of which they are capable. The more clearly these responsibilities are understood and defined, the greater will be the rate of progress. The chief Dominion interest in the forest resources of this country lies in their contribution to our national economy.

With few exceptions the forest areas belong to the provinces. Their protection and management is, and will continue to be, a function of provincial governments. However, the Federal Government has a definite responsibility and can, as it has in the past, assist in the orderly development of the national forest resources. Such assistance takes the form of research in silviculture, forest fire protection, photogrammetry and forest products, as well as economic studies and special investigations. The Dominion Forest Service has made valuable contributions in this field for the past 29 years. This effort has met with the approval of provincial governments and the forest industry. The results of its work have also been of value to the various departments of Federal Government.

At this time it seems opportune to re-state the contribution which the Federal Government can make in the application of scientific forestry in the Dominion of Canada.

The Dominion Forest Service is concerned with the advancement of forest conservation in Canada generally, and with scientific research and investigation of problems affecting the forests. The Dominion Forest Service is the authoritative source of information in Canada on forest economics and research in silviculture, forest fire protection, forest products and aerial forest mapping. Besides these fields of effort it carries out miscellaneous technical investigations

and also advises the Government on forestry matters of national importance; all leading to the orderly development and optimum use of Canada's forest resources on the basis of permanent management.

For the performance of these functions the Forest Service operates in three divisions, as follows:

1. Head Office at Ottawa with sections for forest protection, forest economics, silvicultural research, surveys, aerial mapping, publicity, and administration.

2. Forest Products Laboratories at Ottawa with branches at Montreal and Vancouver.

3. Five Forest Experiment Stations established in representative forest regions throughout Canada for scientific research and investigations in field problems. (Valcartier and Riding Mountain Stations were closed in 1941 for the duration of the war.)

The regular work of the Forest Service has, of course, been greatly curtailed and in part suspended during the war, but under normal conditions is concerned with the following phases on an expanding basis under the various divisions:

Forest Economics

The function of this division is to assemble in co-operation with the provinces and industry all available information relative to the extent and character of the forest resources of the Dominion; to compile data in regard to the depletion of these resources due to cutting, fire, and other causes; and to estimate the extent to which depletion is being replaced by growth, and to compile information in regard to the forest industries and the trade in forest products.

Silvicultural Research

General.—The work of the staff at Ottawa is largely directional, covering project plans, studies, and co-ordination of field operations. Field data are analysed and reported on, field reports are reviewed, and research notes published for the information of other scientific bodies or for industry.

Co-operative planning with outside agencies is conducted. Assistance in an advisory capacity has been given to provincial forest services and to pulpwood operators in planning investigations, more especially in studies of conditions on cut-over lands.

Research.—To determine through research, and to apply on demonstration areas, measures necessary for the handling of forest lands on silvicultural principles and for economical forest management, to obtain sustained yield and to help control depletion. Methods of improving production of second-growth stands are of primary interest. Field studies of timber types and age-classes are conducted at outside areas in co-operation with provincial services and the forest industries. There are over 230 projects in the classifications of botany, ecology, silviculture, mensuration, protection, administration, and economics.

Studies in tree breeding, botany, ecology, and protection are carried on, some in collaboration with the National Research Council and the Department of Agriculture.

Surveys.—Periodical rate of growth surveys are made in selected areas throughout Canada for the purpose of determining the rate of growth for increment in representative types of timber under different silvicultural conditions. These surveys are also for the purpose of determining the rate of mortality and reproduction of the different species.

Forest Fire Protection

Fire-Hazard Research.—Studies on the basic principles underlying different stages of forest inflammability, to determine the degree of fire hazard present at any time in the different climatic and forest-cover divisions of Canada, as an aid to protection forces. This requires continual field studies and office research and also involves the improvement or development of special instruments for use in fire-hazard measurements.

Fire Detection.—Surveys are being conducted to determine the most effective and economical locations for lookout stations on the National Parks. This involves visible area mapping for all lookout points.

Fire-Fighting Equipment.—Experimental work is carried on to improve the quality and design of fire-fighting equipment in order to increase the efficiency of the protection forces.

Aerial Forest Mapping

The use of aerial photographs adapted to the classification and volumetric estimation of forest cover, from studies and research, has resulted in a considerable reduction of ground surveys necessary to produce reliable forest-cover maps and site classification for forest inventory. Experiments are also conducted in ways and means of applying aerial photographs for forestry purposes.

Forest Products Laboratories

The primary purpose of the Laboratories is to promote the more efficient use of forest resources by finding means of curtailing waste; by developing use for species now used to only a limited extent; by improving manufacturing technique so as to extend markets at home and abroad; by improving grading practice; by developing better engineering standards in timber design; by improving specifications for timber structures in building codes; by increasing the life of timber by chemical treatment and in many other ways

The Laboratories have assembled considerable information from researches in their own and similar laboratories throughout the world, and have served as a public bureau of information and consultation for the forest products industries as a whole, as well as for provincial governments, railways, public utility organizations, and municipal authorities.

The main Laboratories are located in Ottawa: the Vancouver Laboratories deal with problems pertaining particularly to British Columbia timbers. The Pulp and Paper Division, conducted in co-operation with the Canadian Pulp and Paper Association and McGill University, is in Montreal.

Work at the Ottawa Laboratories falls chiefly under the headings of timber mechanics, timber pathology, timber physics, wood chemistry, wood preservation, wood utilization, and lumber seasoning, while that at Vancouver deals with like problems with particular reference to British Columbia conditions.

The activities of the Pulp and Paper Division may be broadly divided into fundamental and applied research: under the first heading come such matters as studies of the chemistry of lignin and cellulose, and of materials of potential economic importance derived from them; problems of applied research include such items as studies of chemical and mechanical pulping, developing instruments for measuring printing smoothness of paper, studies of air- and oil-permeability of newsprint, examination of methods of analysing waste sulphite liquor, studies of alkaline pulping and, generally, any special problems arising out of the operation of pulp and paper plants.

Forest Experiment Stations

Research work is conducted on five Forest Experiment Stations situated at strategic locations throughout Canada as follows: Acadia in New Brunswick, area 35 square miles; Valcartier in Quebec, area 7¼ square miles (this station has been closed for the duration); Petawawa in Ontario, area 97 square miles; Riding Mountain, area 25¼ square miles, within the Riding Mountain National Park, Manitoba, and Kananaskis in Alberta, area 63 square miles.

Publicity

The serious depletion of Canada's forest resources by fires, a large percentage of which were started through carelessness and thoughtlessness, indicates a great need for continuity of action to arouse public sentiment regarding the importance of forest conservation. Guidance and assistance are given the Canadian Forestry Association in their educational and publicity work.

FOREST ECONOMICS DIVISION

Final victory over Germany and Japan in 1945 had very little immediate effect on conditions in the forest industries of Canada because the urgency of demand for their products was in no way reduced. Exports of lumber to the United Kingdom, other Empire countries, and the United States continued at high levels. At home, the reduced need for timber for direct war purposes was more than offset by an intensified demand for lumber for construction of new dwellings. Production of logs, pulpwood, sawn lumber, and mill-work continued to be directed by the Timber Control of the Department of Munitions and Supply, and domestic price ceilings were strictly maintained in spite of the fact that prices in export markets were very much above the Canadian level. In order to retain sufficient lumber in the country, the policy of allocating exports and the system of export permits were maintained.

Control of the pulp and paper industry by administrators of the Wartime Prices and Trade Board was continued. Demands for pulp and paper products continued to be far in excess of the quantities it was possible to supply, partly because labour shortages in the woods restricted the output of pulpwood. This situation was relieved to some extent through the efforts of the National Selective Service organization and by the employment of a considerable number of prisoners of war in pulpwood operations.

The following table shows the average rate of consumption and destruction of merchantable timber during the ten-year period 1934-43. Figures in this table are not directly comparable with estimates of depletion published in earlier reports because a new series of converting factors has been used in their compilation. For many years prior to 1945, the Dominion Forest Service and the Dominion Bureau of Statistics converted estimates originally prepared in commercial units—board feet, cords,—to cubic feet by means of converting factors which purported to show the total volume of the trees consumed, including unused stumps and tops. In order to make Canadian statistics directly comparable with those of foreign countries, a new set of factors has recently been adopted which gives cubic volumes of merchantable wood only, excluding stumps and tops. Consequently, the new estimates are somewhat smaller than formerly.

Average Annual Depletion, 1934-43

	Millions of Cubic Feet of Usable Wood
Volume used	2,312
Merchantable timber burned	338
Destroyed by insects and tree diseases	500
	3,150

About 73 per cent of the total depletion was used and 27 per cent was destroyed by fire and epidemic outbreaks of pests.

Replacement of average annual depletion requires an average growth-rate of about 11 cubic feet of merchantable wood per acre over the whole accessible productive forest area of Canada. This is not a high rate of growth, and results obtained in other countries indicate that a much higher rate could safely be maintained if our forests were managed in accordance with sound forestry principles. The beginnings of forest management have made their appearance in certain parts of Canada, but in others there is no systematic control of logging operations. Until more intensive management is introduced, it is very doubtful if Canada can safely increase her output of forest products. As matters stand to-day, severe overcutting exists in certain localities, while the annual growth on other forest areas is not used because they are too difficult of access.

The relative importance of the principal branches of forest industry in 1943 is indicated in the following table:—

FOREST INDUSTRIES

Summary of Principal Statistics, 1943

—	Capital Invested	Employment	Salaries and Wages	Net Value of Products	Gross Value of Products
	$	Man-years (1)	$	$	$
Woods operations	281,000,000	107,790	180,000,000	205,000,000	268,615,283
Lumber industry	115,273,788	43,954	49,564,303	91,714,000	195,885,336
Pulp and paper industry	667,458,143	37,020	71,199,422	164,244,088	344,411,614
Wood-using industries	124,701,572	45,650	57,699,745	90,860,922	187,904,552
Paper-using industries(2)	66,328,954	17,975	23,647,948	51,008,498	116,991,197
Total	1,254,762,457	252,389	382,111,418	602,827,508	1,113,807,982

(1) 300 working days. (2) Not including printing trades.

The net value of the products of the forest industries in 1943 was 7·6 per cent greater than in 1942, and 12 per cent greater than in 1941.

Normal activities of the Economics Division of the Forest Service were carried on throughout the year and a considerable amount of special work was performed for the Timber Controller of the Department of Munitions and Supply. The Chief of the Division acted as Secretary of the Sub-Committee on Resources Development of the Public Investment Committee for the Dominion-Provincial Conference on Reconstruction. He also attended the first meeting of the Food and Agriculture Organization of the United Nations in Quebec and served on the Technical Committee on Forestry and Forest Products of that body.

AIR SURVEY DIVISION

The Air Survey Division owes its existence to the increasing importance of air photographs in the survey of the forest resources of Canada. From the research standpoint a fertile field exists in the development of technique and scientific apparatus and in the obtaining of data on the ground to aid in the interpretation of air photographs in regard to timber quantities and other forest information. An opportunity to couple research with practice has arisen in the forest mapping of federally administered lands such as the Northwest and Yukon Territories, Indian reserves, National Parks, and forest experimental areas, as well as in cases where provincial lands have been mapped in co-operation with the provinces.

During the greater part of the year the work was profoundly affected by the shortage of experienced men, pending the return from the Armed Forces of former members of the air survey staff, three of whom eventually resumed their duties. While overseas these men served in key positions in the use of air photographs and have brought back with them a specialized knowledge of recent photogrammetric development that will be most useful in their work. The training of new men to take the place of former members of the staff and to prepare for an expansion of the work has been an important factor in the year's activities.

Advances were made in the establishment of a procedure for the reproduction of forest map sheets in quantities sufficient for distribution to the public at a small fee, much in the same way as the National Topographic Series. The forest maps will, in fact, be based on the Topographic Series but will, in addition, show the forests in classes according to type, height, and crown density, aided by colour distinctions as obtained in the process of photolithographic reproduction. For the purposes of a thorough trial of the procedure a map sheet comprising about 400 square miles in the vicinity of Harper Lake, Province of Quebec, will be published at a scale of one mile to one inch and to this end the necessary classifying and mapping of the forests of this map sheet from the air photographs was completed.

Following discussions with a representative of Harvard Forest of Harvard University, Petersham, Massachusetts, the Dominion Forest Service co-operated in an experiment conducted by the Royal Canadian Air Force in the use of infra-red photographs in air survey, particularly in reference to the possibility of making use of the pronounced tone distinctions which are brought out in infra-red photographs of the forest. Infra-red photography may be used to distinguish hardwoods from softwoods in midsummer photographs, the former having generally a distinctly lighter tone. However, it is not necessary to rely on infra-red for this purpose, as better results may be obtained by photographing with the ordinary panchromatic film at other seasons of the year, thus taking advantage of the absence of the obscuring deciduous foliage, or, at least, of its distinct spring or autumn tones.

In infra-red photography the shadows are usually dark. On the other hand, the foliage is greatly lightened because of the pronounced effect of the chlorophyll of the green foliage on the infra-red film. The result is a great variety of tones ranging from black shadows to white foliage. As these tones are not necessarily caused by species characteristics it is not yet known whether softwood species can be better identified by means of infra-red.

SILVICULTURAL RESEARCH DIVISION

During the year a number of foresters who had been absent on military leave returned to duty with the Service. This increase in technical staff made it possible to review many of the projects which had been left in abeyance during the war years and to plan for the resumption of silvicultural research investigations in the post-war period. A number of positions were established but it was found impossible to fill any great number of these owing to the lack of trained personnel.

SILVICULTURAL RESEARCH BOARD

A Silvicultural Research Board was established, the members of which are the Acting Dominion Forester, the Chief of the Silvicultural Research Division, the Assistant Chief of the Silvicultural Research Division, and other foresters whom they may call upon to serve from time to time. This board undertakes the review of all silvicultural research projects, both old and new, with the object of giving full consideration to the value of the project and the plans for investigation. It also assigns such projects to the forest officer considered to have the best qualifications for the undertaking.

District Offices and Forest Experiment Stations

The District Office at Winnipeg, which was closed early in 1942, was reopened.

The Valcartier Forest Experiment Station, closed in 1941, was reopened toward the end of the year and the normal functions which this station carries out in the Province of Quebec were resumed.

Roads, buildings, telephone lines, and other physical improvements on the Acadia, Petawawa, and Kananaskis Forest Experiment Stations were kept in good repair.

All permanent sample plots due for remeasurement on the Petawawa, Kananaskis, Acadia, and Riding Mountain Stations were re-examined and notes taken. No additional plots were established as operations on these areas were distinctly on a maintenance basis.

In the management of the Petawawa, Kananaskis, and Acadia Stations, a considerable amount of timber was removed. At Kananaskis this consisted of mine props and fuel-wood cut from the 1936 burn. These mine props went to the Canmore and Drumheller mines and the fuel-wood supplied the requirements of a local lime kiln as well as an internment camp and a number of military camps. Timbers cut from the Petawawa Station went to mills located at Pembroke. The following table gives a summary of the products cut on these three stations:—

	Kananaskis	*Petawawa*	*Acadia*	*Total*
Sawlogs, ft.b.m.	....	2,023,253	..	2,023,253
Fuel-wood, cords	3,307	792	99	4,198
Pulpwood, cords	....	101	34	135
Mine props, lin. ft.	900,055	....	..	900,055
Bldg. logs, cu. ft.	....	718	..	718
Poles, etc.	....	887	..	887

Spruce Budworm

A project was undertaken in the Maritimes District to check the feasibility of controlling the spruce budworm through the practice of planned forest management based on a sustained yield operation. This project was undertaken in co-operation with:—

(*a*) The Forest Insect Division of the Science Service Branch, Dominion Department of Agriculture.
(*b*) The Forest Service, Department of Lands and Mines, Province of New Brunswick.
(*c*) Fraser Companies Limited, pulpwood operators.
(*d*) The Forest Insect Control Board.

Briefly stated, this project is based on the assumption that old growth, particularly of balsam fir, is most susceptible to attack by the spruce budworm and least likely to recover from such an attack. Plans call for the early removal of this old growth in the expectation that when an infestation reaches this area comparatively little damage will result, owing to the absence of mature and overmature fir and spruce trees. Investigations have shown that young and vigorous trees of these two species suffer less damage than older trees.

In order to put this plan into operation, it is proposed to make all parts of the experimental area available through the construction of roads and to remove from the area all mature or overmature trees of pulpwood species.

This area in New Brunswick, on the limits of Fraser Companies Limited, was selected for this experiment because it is expected that it will be some years before the budworm reaches this location in its spread eastward. In the interim it is hoped to complete the logging of the mature timber and so make this area immune from budworm attack.

The Silvicultural Research Section has assigned a forester to this project who is working under the direction of our District Forest Officer in Fredericton and a committee of the co-operating agencies known as the Green River Working Committee. This forester is co-operating with entomologists and other specialists who have been assigned to this project.

During the year Research Block No. 1 was selected and the boundaries clearly defined on the ground. This block contains 4,023 acres and within it one-tenth acre plots have been established at six-chain intervals on lines spaced ten chains apart. Complete notes have been taken on each plot showing a record of all trees by species and timber classes, nature and extent of reproduction present, direction of slope and other topographic features, kind and character of ground vegetation, and other data considered relevant. This block is to be logged during 1946. These plots will be re-examined after logging and subsequently re-examined every five years. Other research blocks are to be selected for similar examination within the 400-square mile area selected for management.

Farm Woodlots

With the co-operation of the Dominion Department of Agriculture, the New Brunswick Forest Service, and the Nova Scotia Forest Service, this division selected a number of woodlots located on Dominion Agricultural Experiment Stations and Illustration Stations in the Maritimes and, after an examination of each, prepared detailed working plans for their management on a sustained yield basis. These particular woodlots were selected because farmers in the adjoining country visit these experimental farms in large numbers each year, and, when doing so, they will have an opportunity to observe for themselves the benefits of planned woodlot management. The statistical information available shows that returns to farmers in the Maritimes region from products cut on their woodlots rank quite high in the economy of the region. Furthermore, there is no doubt that the return from these woodlots can be materially increased through the initiation of certain sound forestry practices.

A trained forester has been assigned to this project in order that he may give advice to woodlot owners on the management of their woodlots and to stimulate interest in woodlot management through addresses and press releases.

Tree Breeding

A tree breeding committee, comprising representatives of the National Research Council, the Department of Agriculture, and the Dominion Forest Service, met several times during the year in order to discuss questions related to the development of new strains. Experimental work was continued during the year in the testing of strains of several species developed from seeds and cuttings. Special efforts are being made to develop suitable material of (*a*) white pine resistant to weevil and blister rust; (*b*) spruce of rapid growth and with good pulping fibres; (*c*) poplar of improved qualities for matchwood and pulpwood; (*d*) poplar suitable for planting in windbreaks on the Prairies.

Rate of Growth

The Ontario Forest Service co-operated with the Dominion Forest Service in relocating one-tenth acre sample plots established in the Goulais River Drainage Basin near Sault Ste. Marie in 1926. About one-third of the area was covered and 95 per cent (180) of the plots were found. The lines between plots were reblazed and the corner stakes marking the boundaries of the plots replaced. This project will be continued next year and the remaining plots will be relocated and all plots remeasured.

Canadian Pulp and Paper Association

The Woodlands Section of the Canadian Pulp and Paper Association held its annual field meeting at the Petawawa Forest Experiment Station on May 25 and 26. This meeting was devoted to papers and discussions on silviculture and the examination of a number of permanent sample plots established on the area, in the forest types where pulpwood species are dominant. This meeting was attended by representatives of a large number of pulp and paper companies operating in Eastern Canada, representatives from the Faculties of Forestry of the Universities of New Brunswick and Toronto, and representatives from Dominion and provincial forest services. The following three resolutions were passed at this meeting:

I. Whereas it is recognized by the forest industry and Governments that there is an urgent and definite need for fundamental and factual data on the regeneration on cutover areas and rate of growth surveys, and whereas such information is essential to the perpetuation of Canada's forest resources, be it therefore resolved that a Joint Committee be set up, consisting of representatives from the forest industry, Provincial and Dominion Government Forest Services, with a view to finding ways and means of implementing the proposals with respect to surveys as outlined in the papers presented by the Dominion Forest Service at this meeting.

II. Whereas experimental work is necessary in our pulpwood forests to study methods for increasing the growth rate of desirable species, be it resolved that experimental areas be established for such purposes.

III. Whereas it is essential to collect and review all available data pertaining to Canada's forests and tree species, preparatory to further research and application of forest management practices, be it therefore resolved that the Woodlands Section consider recommending to the Dominion Forest Service that the Dominion Forest Service undertake this collection and review of such data, their publication and dissemination.

Publications

Silvicultural Research Note 74, Succession Cutting in Pine—W. M. Robertson.

Silvicultural Research Note No. 75, Some Observations on Silvicultural Cutting Methods—W. M. Robertson.

Silvicultural Research Note No. 76, Knot-free Red Pine by Debudding—A. Bickerstaff.

Silvicultural Research Note No. 77, Growth of Aspen—G. Tunstell.

Silvicultural Research Note No. 78, Effect of Different Methods of Slash Disposal of Jack Pine Reproduction—J. W. Noakes.

Silvicultural Leaflet No. 21, Outline for a Working Plan.

Silvicultural Leaflet No. 22, Balancing Increment per Tree Against Maximum Increment per Acre—A. Bickerstaff.

Silvicultural Leaflet No. 23, Assessing the Growth of Individual Trees by Radial Increment—A. Bickerstaff.

FOREST PROTECTION DIVISION

Organized forest fire protection in Canada now covers an area of some 750,000 square miles. This is equal to about 60 per cent of the total forested area of the country. Most of the unprotected forested land is either non-productive or inaccessible for commercial use at the present time.

Fire Losses

The area burned and damage caused by forest fires in 1945 were considerably less than the average for the previous ten years (see Table 1). Losses in British Columbia were unusually heavy. Nearly half of the area burned and more than half of the total damage for the whole of Canada occurred in that Province. Elsewhere, however, the losses sustained were much below normal.

Although there were 4,761 fires in 1945, or 86 per cent of the average number for the past ten years, the average area burned per fire was only 35 per cent of the previous ten-year figure. The total area burned, 741,531 acres, was the lowest recorded since 1927.

Fire losses for the various provinces and for lands under Dominion administration are shown in Table II.

Causes of Fires

More than one-quarter of the forest fires in 1945 were attributed to smokers (Table III)—a marked increase over the average number of fires from this cause in the period 1935-44. Camp-fires and railways were next in importance among the man-made causes, each being responsible for 15 per cent of the total number. The proportion of campers' fires was slightly less than in the preceding 10 years, but the number of railway fires has increased greatly as a result of war-time operating conditions.

Lightning, the only unpreventable cause, was responsible for 18 per cent of the forest fires in 1945.

Legal Proceedings

The number of prosecutions and convictions under the forest fire laws is shown in Table IV. Legal proceedings were instituted in a much smaller number of cases than during the previous year. No loss of life resulted from forest fires in 1945.

Weather Conditions

Throughout the Province of British Columbia weather conditions resulted in hazards considerably worse than average. Although periodic relief occurred, extremely critical fire danger developed in all forest districts during some part of the fire season.

In the three Prairie Provinces rainfall was generally heavier than normal, and was quite well distributed. Dangerous conditions occurred locally in Alberta and Saskatchewan during the month of May, and a high hazard existed in Manitoba towards the end of August, but these periods were of relatively short duration.

From Ontario eastward the early disappearance of the snow resulted in a larger proportion of April fires than usual. Abundant rainfall in May, however, prevented the widespread development of a critical hazard condition such as commonly occurs in that month. The weather in Ontario during the remainder of the fire season was for the most part favourable, although high hazards were experienced in the eastern districts from the latter part of July until the middle of August.

The average precipitation in Quebec was nearly normal, but the distribution was not uniform throughout the Province. The greatest amount of rain occurred in the southern and central sections, and deficiencies were reported in both eastern and western districts. High hazards developed locally in June and July, and more generally in August.

In the Maritime Provinces a relatively good fire season was experienced. Rainfall in New Brunswick was equal to or greater than normal except in the month of August. There was less rain than usual in Nova Scotia, but the humidity remained sufficiently high to prevent the development of critical danger periods.

Throughout Eastern and Central Canada serious hazard conditions did not occur during the autumn months.

Forest-Fire Research

Although work of the Division is still handicapped by a shortage of staff, some progress has been made in the investigation of problems relating to forest-fire protection. A survey of the research requirements of forest protection services in Canada was completed, and from this a long-term program of research projects was prepared.

The Forest Fire Hazard Tables, last issued in 1940, which are used for the daily measurement of forest inflammability, have been revised and considerably simplified for field use. The reliability of both the old and the new tables was verified by a study of the actual occurrence of forest fires during a six-year period, in the National Parks of Western Canada. It is expected that the new tables will be available to forest protection officers early in the 1946 fire season.

Analyses of long-term trends in the Dominion fire statistics were brought up to date. War-time influences on forest fires in Canada, as revealed in these statistics, were examined and published.

Field studies, carried out at the Petawawa Forest Experiment Station, were limited to routine investigations of equipment for the determination of forest-fire hazard, and inflammability tests in poplar and cut-over jack pine stands.

Table I

Forest Fire Losses in Canada, 1945, Compared with 10-Year Average 1935-44

Item		Annual Averages 1935-44	Year 1945
Fires under 10 acres	number	.....	3,681
Fires 10 acres and over	"	.....	1,080
Total number of fires		5,533	4,761
Area burned—			
Merchantable timber	acres	554,723	159,909
Young growth	"	663,088	161,641
Cut-over lands	"	370,611	129,361
Non-forested lands	"	852,434	290,620
Total area burned	"	2,440,856	741,531
Merchantable timber burned—			
Saw timber	M. ft. b.m.	720,842	686,200
Small material	cords	2,491,905	289,153
Estimated values destroyed—			
Merchantable timber	$	2,603,603	1,018,679
Young growth	$	891,904	399,144
Cut-over lands	$	313,096	78,103
Other property burned	$	502,835	779,777
Total damage	$	4,311,438	2,275,703
Actual cost of fire-fighting	$	868,197	993,818
Total damage and cost	$	5,179,635	3,269,521

Statistics of Forest Fires by Regions, 1945

(Averages given are those for 10-year period 1935-44)

—		British Columbia		Alberta		Saskatchewan		Manitoba		Ontario	
		Average	1945	Average	1945	Average	1945	Average	1945	Average	1945
Fires—											
Total number		1,613	1,838	330	284	263	98	370	168	1,254	966
Caused by lightning	%	35	29	3	6	6	5	8	15	20	12
Areas burned—											
Merchantable timber	acres	40,211	92,481	173,193	29,785	59,774	20,387	41,314	1,838	133,283	9,301
Young growth	"	53,680	79,971	207,407	53,178	247,441	6,180	35,547	2,738	60,097	9,530
Cut-over lands	"	107,942	92,695	18,045	5,510	19,922	5,854	4,066	279	31,627	5,894
Non-forested lands	"	111,924	87,745	264,036	128,263	191,826	17,302	158,541	6,580	78,070	23,785
Total	"	313,757	352,892	662,681	216,736	518,963	49,723	239,468	11,435	303,077	48,510
Damage	$	753,972	1,443,053	1,073,462	267,181	229,965	12,269	152,272	11,033	801,863	286,062
Cost of fire-fighting	$	213,136	483,928	85,351	64,004	71,696	3,404	29,966	4,189	214,621	230,454
Total damage and cost	$	967,108	1,926,981	1,158,813	331,185	301,661	15,673	182,238	15,222	1,016,484	516,516

—		Quebec		New Brunswick		Nova Scotia		Dominion Lands					
								National Parks		Indian Lands		For. Expt. Stations	
		Average	1945	Average	1945	Average	1945	Average	1945	Average	1945	Average	1945
Fires—													
Total number		1,062	996	236	168	278	169	65	19	56	45	6	10
Caused by lightning	%	6	13	7	10	0	1	12	47	11	7	0	0
Areas burned—													
Merchantable timber	acres	89,326	4,357	6,000	386	1,212	48	6,577	9	3,428	1,316	405	1
Young growth	"	22,521	2,200	6,732	4,658	5,240	1,050	21,245	16	2,392	2,116	786	4
Cut-over lands	"	159,128	16,728	23,871	567	1,107	500	4,249	128	612	1,204	42	2
Non-forested lands	"	20,779	20,403	3,928	1,590	5,390	2,542	10,286	0	7,050	2,370	604	40
Total	"	291,754	43,688	40,531	7,201	12,949	4,140	42,357	153	13,482	7,006	1,837	47
Damage	$	976,340	205,526	219,387	34,700	24,179	10,105	61,552	316	12,841	5,448	5,605	10
Cost of fire-fighting	$	190,214	151,109	24,901	37,485	16,732	9,476	16,575	1,329	4,477	8,401	528	39
Total damage and cost	$	1,166,554	356,635	244,288	72,185	40,911	19,581	78,127	1,645	17,318	13,849	6,133	49

TABLE II

TABLE III

Forest Fires in Canada, 1945, by Causes, Compared with 10-Year Average—1935-44

Cause	Average 1935-44		Year 1945	
	No.	%	No.	%
Camp-fires	977	18	710	15
Smokers	936	17	1,237	26
Settlers	841	15	364	8
Railways	315	6	723	15
Lightning	972	17	865	18
Industrial operations	150	3	173	4
Incendiary	330	6	117	3
Public works	50	1	14	0
Miscellaneous known	464	8	354	7
Unknown	498	9	204	4
Totals	5,533	100	4,761	100

TABLE IV

Fire Season, 1945—Comparative Statement by Regions

Region	Increase or Decrease in Relation to Average for Period 1935-44			Proceedings Under Fire Laws		Deaths
	Number of Fires	Area Burned, Acres	Cost Plus Damage	Prosecutions	Convictions	
			$			
British Columbia	+225	+ 39,135	+ 959,873	31	29	0
Alberta	− 46	− 445,945	− 827,628	58	49	0
Saskatchewan	−165	− 469,240	− 285,988	1	1	0
Manitoba	−202	− 228,033	− 167,016	0	0	0
Ontario	−288	− 254,567	− 499,968	15	13	0
Quebec	− 66	− 248,066	− 809,919	8	7	0
New Brunswick	− 68	− 33,330	− 172,103	32	29	0
Nova Scotia	−109	− 8,809	− 21,330	12	12	0
Dominion Lands	− 53	− 50,470	− 86,035	2	2	0
Canada	−772	−1,699,325	−1,910,114	159	142	0

FOREST PRODUCTS LABORATORIES

In the early part of the year problems pertaining to the prosecution of the war demanded the greater part of the facilities of the Laboratories. However, with the termination of the war, heavy demands were made for technical assistance in the conversion of industry to a peace-time basis, the rehabilitation of public utilities on which little maintenance had been possible during the war, increased housing and industrial accommodation, and other related problems.

During the war, under the stress of circumstances, many new and unusual techniques were developed and applied in the utilization of timber, plywood, pulp, paper, and other products based on wood. Since the conclusion of the war, keen interest has been shown by industry in the possibilities of commercial application of these techniques to a peace-time economy. This has opened up a very wide and important field in forest products research. Particularly encouraging is the widespread interest among wood-using industries in the possibility of making better use of timber resources by the use of material previously entirely wasted or applied to very low-grade uses. These developments pertain to the fields of engineering, chemistry, and biology. They promise developments of outstanding industrial significance.

Following are brief references to some of the more important fields of research which have engaged the attention of the Laboratories.

MAIN LABORATORIES—OTTAWA

DIVISION OF TIMBER MECHANICS

A great deal of research was carried out by the Laboratories during the war with new types of adhesives for use in wooden aircraft, boats, landing barges, and pontoons. The manufacture of components for this equipment was carried out in furniture factories and other wood-working plants, with the result that interest was aroused in their application to peace-time industry. The Laboratories have co-operated with wood-using industries in the technical problems associated with the use of such adhesives, and particularly in investigating the suitability of the different types of adhesives for specific applications.

The Laboratories continued active co-operation with the Canadian Packaging Committee until it completed its work, and participated in conferences with respect to continuation of the work under different auspices, in connection with post-war trade. The Laboratories were made custodians of the codes and specifications prepared by the Committee, pending the setting up of a permanent organization to deal with packaging specifications and research.

Investigations were carried out on impact packaging materials of cellulose, excelsior, wool, hair, fibre, etc. An extensive investigation was carried out on the design of a case for shell eggs for export. Tests were carried out on the significance of moisture content of shooks for boxes, and it was shown that the use of green lumber reduces the strength of the box about 50 per cent.

There is a wide demand for telephone and power-line poles for rural electrification in Canada and the United States and for rehabilitation and extension of existing facilities. The Laboratories, on invitation of the American Standards Association, participated in conferences to establish specifications for

species of timber not previously used for such purpose. The Laboratories also conducted an extensive series of tests on jack pine poles affected with red-stain and red-rot, which greatly assisted in curtailing rejection of such poles and improving the supply situation. Attention was also given to progressive heart-rot in cedar poles in service twenty years.

In view of experience with war-time timber structures, considerable feeling has developed in the timber industry that existing specifications are too conservative with respect to factors of safety in timber construction. Considerable work was carried out on the re-analysis of existing test data in this regard. A conference of representatives of the United States and Canadian Laboratories was held to review data and to endeavour to find a common approach to this matter, since species used and conditions of use are so similar: agreement in this regard will also facilitate grading for export between the two countries.

In view of the present wide demand for railroad ties, careful consideration is being given by the railroad companies to the use of species previously used to a limited extent only, and to the acceptance where practicable of material formerly rejected under existing specifications. A good deal of work was carried out and advice given on request in this connection. Numerous spike-retention and strength tests were carried out on jack pine ties containing red-rot, which yielded results of considerable economic importance.

The extensive use of plywood and other laminated construction during the war has raised a number of technical problems. Laminated construction is found in a wide variety of uses, namely in aircraft, in exterior siding of houses, and in laminated keels for boats. Such construction must be shown by suitable tests to be capable of serving adequately over an extended period. A great deal of time was spent on investigations as a basis for establishing standards and methods of tests for specific uses. A wide variety of adhesives was dealt with under this investigation, for an adhesive suitable for one type of use may be entirely unsuitable in another application.

Work on the effect of temperature and humidity on exposed wooden aircraft, carried out since 1943 at Prince Albert and Ottawa stations, was completed during the year and a comprehensive report prepared. This was part of an integrated investigation carried out by arrangement of the Ministry of Aircraft Production in Great Britain, in the United States, India, Australia, South Africa, and Canada.

Hardwood flooring has been in very short supply for housing and industrial building. The Laboratories carried out considerable work on the practicability of bonding hardwood veneers to softwood backing for flooring strips and also for flooring panels. Some of the assemblies required a sub-flooring and others were of sufficient thickness to withstand full floor loads. Some of these show considerable promise of satisfactory application at reasonable cost. They permit also the possibility of using waste from veneer plants and fairly low-grade lumber. Considerable attention had to be given to the development of a method of testing these floorings which would be suitable and satisfactory to building authorities. This work is continuing.

In co-operation with the British Army Staff and the William Clapp Marine Laboratory of the United States, special panels were prepared on the Laboratories' plywood press, with the object of developing plywood for naval craft such as wooden boats, scows, tugs and motor-boats, which would be resistant to attack by teredos and other marine organisms. Experiments included special treatment of the veneers and also the addition of certain materials in the glue lines. A good deal of success was attained and further work is planned with a view to simplifying procedure and reducing cost.

The Laboratories co-operated with a group of research workers in the University of Toronto in a study of adhesion. Considerable difference of opinion exists in this connection, and until more is known about adhesion it is difficult in many cases to supply a satisfactory answer as to why bonding fails under specific conditions.

At the request of the Logging Sleigh Committee of the Woodlands Section of the Canadian Pulp and Paper Association, tests were made upon beams and runners of solid and laminated wood to determine their relative strength. A scale model of a Ginsberg single-runner sleigh was built to illustrate the principles and advantages of this type of construction to lumbermen interested in sleigh development.

At the request of the Tool Committee of the Woodlands Section of the Canadian Pulp and Paper Association, tests were made to determine the degree of tension in saw-frames discarded as unusable in comparison with the tension in new frames, also comparative tension tests on steel and aluminum saw-frames. The investigation included also the re-tensioning of discarded frames.

DIVISION OF WOOD PRESERVATION

Work was continued on tests of preservatives used to protect wood products from decay and insect attack during shipment and storage overseas. Specifications for the treatment of this material were prepared for the Canadian Packaging Committee.

During the war, work was carried out on development of fire-retardant paints, and this method of protecting wood, particularly in houses, from ignition by small sources of heat and flame should receive more attention in the post-war period. An approval test for fire-retardant paints for use on government buildings was developed. Further use of fire-retardant paints will require general acceptance of an approved test for inclusion in city building codes.

The use of organic types of wood preservatives such as copper naphthenate and chlorinated phenols, with varying degrees of resistance to volatilization and leaching, is increasing. Laboratory tests were developed to provide information on the relative stability of these preservatives under the conditions of the test. The problem is still under study.

Work was continued on recording the service life of treated and untreated timber products in Canada in co-operation with industrial organizations and government departments. A total of 960 tests have been started to date, of which 750 are still active.

Studies of the average service life of groups of small jack pine posts cut at different seasons throughout the year, to determine the effect of time of cutting on durability, were completed. Each group was divided into two lots to determine the durability when: (*a*) handled with care by prompt removal and kiln-drying immediately after cutting, (*b*) carelessly handled by leaving the posts for some months in the bush after cutting.

DIVISION OF WOOD CHEMISTRY

A small wood hydrolysis pilot plant has been installed and experimental work started. Douglas fir chips were first treated according to a standard Scholler procedure. Certain changes in the standard hydrolysis procedure are contemplated, with a view to increasing yields and concentrations of reducing sugars, following which completely different hydrolysis techniques will be tested.

In the hydrolysis of wood by the Scholler process, a lignin residue is obtained for which there is little use except as a fuel. Having in view the use of this residue in plastics, attempts were made to improve its flow properties. Spruce Scholler lignin was treated with nitric acid solutions to produce residues containing carboxyl groups, and these residues were then polymerized with glycerol: another series of experiments was undertaken in which this lignin was treated under pressure with various concentrations of sodium hydroxide, of sodium bisulphite, and of sodium hypochlorite. This problem will require further investigation.

The existing methods of wood hydrolysis make use of either (1) concentrated hydrochloric acid at room temperature, or (2) dilute sulphuric acid at high temperature. The former process (Bergius) has never been considered to be economically feasible in Canada. The dilute sulphuric acid process (Scholler) requires very expensive equipment, such as high-pressure autoclaves, and percolators, and a very large supply of sawdust or other wood taste at one centre.

The idea of hydrolyzing part of the wood in a flue-gas atmosphere under atmospheric pressure has been tried on a small laboratory scale. Further work is required in order to find out more about the economics of the process. The project was initiated with a view to determining the practicability of recovery of part of the theoretical yield of wood sugars with inexpensive equipment at plants where only limited supplies of waste wood are available.

About 10 to 15 per cent of the total volume of pulpwood consists of bark which is now either wasted or used as fuel. A project was undertaken to study the chemical compositions of various barks with a view to better utilization. The first bark investigated was that from Western red cedar. This was separated into inner and outer bark fractions, which were analysed for ash, one per cent alkali-soluble, water-soluble, alcohol-soluble, and for lignin and pentosan. These fractions were also pulped with various reagents in an attempt to determine the lignin and polysaccharide components present. As a preliminary to the laboratory study of bark, a literature review was made on this subject and a report prepared.

Owing to the wide interest shown in the methylolurea treatment of wood, these Laboratories undertook some experiments in this field. Yellow birch heartwood and sapwood samples were treated with dimethylolurea and urea according to a procedure recommended by a manufacturer of these chemicals. It was found that the heartwood absorbed only about 10 per cent of its weight of chemicals and its physical properties remained almost unchanged by the treatment. The sapwood on the other hand absorbed about 30 per cent of its weight of chemicals but only a few of its properties were affected. The hardness and strength in compression perpendicular to the grain were increased considerably, but the Izod impact strength was appreciably reduced.

Efforts to produce a hardboard of reasonable strength from wood waste have been continued. Many binding materials have been tried, some of which show promise. The greatest difficulty in the use of sawdust as a raw material for this purpose is the high percentage of cut fibres. Shavings are more satisfactory in this respect. On account of the increasing requirements for buildng materials and the abundance of wood waste, this project will be continued.

Preliminary plans have been made to subject waste sulphite liquor and lignin solutions to the action of electrolysis. After considering the feasibility and potential merits of such an approach to this problem, plans were worked out, cells were designed, and the necessary equipment was ordered. The aim of the investigation is to produce valuable chemicals from lignin by cathodic hydrogenation and anodic oxidation. Other processes such as anodic chlorination and oxidation of sugars which might be present in the solutions will be investigated.

DIVISION OF TIMBER PHYSICS

In the investigation of chemical treatment of trees to prolong the period during which bark is readily removable, black spruce and poplar of pulpwood size, and white spruce of sawlog size were treated with various chemicals along the lines of previous experiments. It was noted that the effect of certain chemicals applied late in the natural peeling season (July) was that sawlogs of spruce would stand until felled in November without developing blue-stain and without being attacked by wood-borers.

While the very effective killing action of ammonium sulphamate on all trees tested was confirmed, it is planned to look for chemicals that not only have quick killing action on trees, but also have repellent action on wood-boring insects and prevent fungus stains in the wood of treated trees during the warm summer before felling. Material from trees killed by different chemicals was examined microscopically in order to note the structural characters that affect the ease of peeling. A general summary of work to date was prepared for discussion at the annual meeting of the Canadian Pulp and Paper Association.

In studying coatings of adhesive on wood, samples of glue joints broken in testing were examined microscopically. For joints which broke so near the adhesive layer that it is difficult to distinguish (by ordinary visual appraisal) the failure in the wood from that of the adhesive, it was found that the failures can be classified and measured as required with the aid of the compound microscope. Such classifications and microscopic measurements can be conveniently recorded on low-magnification photomicrographs of the fractured surfaces.

It is believed that the adaptation of microscopic observation to coatings on wood (in studies of adhesives and finishes) brings an important method of appraisal and analysis to the study of factors affecting the deterioration of such coats.

Views of the Canadian Standards Association's Sub-Committee on Loose Wood Fibre Insulation were presented by the Laboratories to the Canadian Electric Code Committee of the Canadian Standards Association with regard to providing standards for thermal insulation used in spaces of buildings in proximity to electric wiring.

New wording was adopted on the lines suggested to clarify the section of the Canadian Electric Code dealing with the subjects, and a committee was appointed to determine suitable standards to govern the use of thermal insulating materials to be used near electric wiring.

In connection with studies of variation in density and in structure of wood of rock elm and white elm, an attempt was made to find a more satisfactory method than is now commonly used for rapid identification of the wood of the true rock elm, *Ulmus Thomasi,* in order to distinguish it from dense wood of other species sometimes sold as rock elm. A method of identifying rock elm by visual examination has been checked against more precise observations with a low-power magnifier and with the microscope and found to be positive for distinguishing wood of rock elm from the common Canadian species of elm, *U. americana,* and *U. fulva.*

Samples of wood or wood materials in the form of manufactured articles, timber specimens, pulpwood chips, paper, sawdust, and wood flour have been examined and identified as to species, on request. In view of growing interest in the use of bark from pulpwood, an address was presented, by request, at a meeting of the Technical Section of the Canadian Pulp and Paper Association, describing the structure and physical properties of bark of various species.

Microscopic preparations of various domestic and foreign woods were added to the files. This includes material from trees killed by various chemicals, and material with special defects such as compression-wood, and, in the case of veneers, the manufacturing defect known as "loose-cutting" or "back-check".

DIVISION OF TIMBER PATHOLOGY

A laboratory study based on wood from white and rock elm trees was carried on to test the relative resistance to decay of the two species. A great range of variation was noted in the many samples tested. No correlation, however, was found between resistance to decay and specific gravity in either species, nor under the conditions of test did the material under study reveal any difference in the decay-resistance of the two species. As a field test and a check on the laboratory work, elm pickets were installed in a test plot. Their resistance to decay will be checked periodically over an extended period.

Eight wood-rotting fungi and many moulds and bacteria were isolated from the green elm. Their reactions on elm wood in culture will be studied.

Twenty creosoted jack pine ties containing red-stain were removed from an experimental track in which they had been in service seventeen years. The ties on the whole were in good condition. Analysis showed *Trametes pini* alive in one tie, but there was no evidence of the development of pocket rot in the ties. Secondary rot was present in some of the ties.

Nine fungi isolated from sections of green jack pine poles were inoculated into jack pine blocks in culture jars under aseptic conditions. These cultures are being held under observation to determine the effect of the fungi on the wood.

Fungi causing rot in posts in a test plot were isolated, and some were identified. Fungi were isolated from samples of timbers from a gold mine in northern Ontario, and advice was given as to methods of controlling decay. The rot in samples of wood from folding boats and pontoons sent in from British Columbia was identified. Advice was given in connection with four cases of dry rot which had developed in house timbers. The cause of decay in the ceiling of a cold room used for the storage of fish was determined, and recommendations were made for its eradication. The cause of bio-luminescence in an oak sample submitted was determined.

Three fungi were isolated from a section of brash cedar submitted for examination and their action on cedar is being investigated. A study of air-borne fungi from lumber-seasoning yards is being carried on. Other defects dealt with had to do with rot and stain in spruce, rot in mahogany, yellow stain in birch, mould on lumber and fabrics, and decay in red pine and birch.

Cultures of thirty wood-rotting fungi, representative of twenty-one species, were added to the reference collection.

DIVISION OF LUMBER SEASONING

The problem of obtaining properly seasoned lumber for both war-time and peace-time uses was still acute. In a number of instances it was impossible to obtain satisfactory lumber for pressing war-time and other requirements and the semi-commercial dry kilns of the Laboratories were operated on a custom basis.

Birch lumber was conditioned prior to treatment with dimethylolurea and also subsequent to such treatment in order to condition it to a suitable moisture content for physical and mechanical tests.

Plywood was conditioned in the Laboratories' dry kilns in connection with an investigation to determine the effect of high temperature on casein and cold-setting urea resin glues. This conditioning period was of ten weeks' duration.

Box shooks were conditioned to various moisture contents for an investigation to determine the comparative strength of shipping containers manufactured from green and from seasoned lumber. This investigation was requested by the Canadian Packaging Committee.

Moisture range determinations were made in connection with an investigation on the seasoning of large timbers by means of radio-frequency heating.

Assistance was rendered to a large number of small operators who either owned makeshift kilns or who requested information on kilns which might meet their requirements. Often it was not practicable, on account of cost, to suggest modern designs of kilns, but rather some alternative design which would meet requirements reasonably.

Information or service was supplied on the following subjects: dry kiln schedules and kiln operation; storage of veneer logs and the effect of extended periods of seasoning; drying of timber by radio-frequency and infra-red electric heating; the most effective methods of yard seasoning, and the effect of rate of air circulation in dry-kilns on the drying time of lumber.

MISCELLANEOUS

During the war, radio frequency dielectric heating was used in the wood-working industries in some countries as a versatile production procedure. Little use of this method of heating has been made in Canada, and it was decided that it warranted investigation. Accordingly, two radio-frequency generators were obtained, the larger of which has an output of 7·5 kilowatts and the smaller an output of 500 watts.

Work has been initiated on the preparation of a radio-frequency setup suitable for laboratory work, and a variety of electrode systems and associated ancillary equipment have been prepared as the necessary material became available.

After the initial installation work was completed, exploratory tests of a very broad nature were made on a number of potential applications relevant to the wood-using industries, including bonding of plywood, laminating of timbers,

lumber seasoning, and paper drying. These experiments suggested lines of investigations and test methods. Based on this work, a program of radio-frequency heating was prepared.

A representative of the Laboratories made an extensive tour of wood products companies in the eastern United States which are employing radio-frequency heating in the manufacture of their products, to obtain information on industrial techniques and research of interest to Canadian wood industries.

Vancouver Laboratory

The Vancouver Branch of the Forest Products Laboratories is operated in co-operation with the University of British Columbia to provide local service to British Columbia lumber production and wood utilization industries, and to make available information on new and improved methods for the utilization of British Columbia woods.

DIVISION OF TIMBER MECHANICS

Standard testing was carried out on amabilis fir and on mountain hemlock from a logging area adjacent to Vancouver. Changing conditions within the logging and milling industries, the inclusion of second growth and timber from much higher altitudes, and marked variations noted in quality within a single species, indicate the necessity of establishing the basic properties of important commercial species on a more closely defined areal basis. A clearer definition of the range in properties is also desirable so that such values may be more closely related to the specific use to which timber is put. Work in these fields was initiated.

A study was completed to determine the effect of kiln seasoning upon the mechanical strength of Western hemlock of aircraft quality and to establish satisfactory drying schedules which would not damage the wood.

The Laboratory provided service to those who required specific information or tests relating to the glues which they were using and to new glues proposed for use. The work involved examination of glued joints, glued-up laminated construction and the manufacture of plywoods. In the early part of the year a large volume of testing was carried out for the Royal Canadian Air Force and manufacturers of aircraft.

An analysis of the results of tests on Douglas fir and Western hemlock structural timbers in the three merchantable grades defined by Export Grading Rule No. 1 of the British Columbia Lumber and Shingle Manufacturers' Association was well advanced. This investigation was carried out in close co-operation with the British Columbia Lumber and Shingle Manufacturers' Association and the Pacific Lumber Inspection Bureau. A great deal of analytical work was carried out with regard to the practicability of revising permissible design stresses presently incorporated in building codes and in standard specifications.

Tests were made on Western white birch plywood to determine the effect on the mould resistance of casein glues of treating the glue with a preservative toxic to mould organisms.

Assistance was extended to a local manufacturer of "improved wood" in studying the impregnation of local woods with dimethylolurea and its effect on the hardness and other properties of the wood for use in flooring, furniture, and other products.

The Laboratory co-operated with the University of British Columbia in an investigation of the impregnation of several species of wood with synthetic resins and of the effect of compressing the wood after impregnation and setting the resin by radio-frequency dielectric heating.

Several creosoted wood stave pipe sections of diameters from 12″ to 60″ were tested in accordance with American Society for Testing Materials specification C-13-447, using a sand-box loading.

The International Pacific Salmon Fisheries Commission was given assistance in planning tests to required specifications of all materials for use in the construction of a fish-way at Hell's Gate on the Fraser River.

A large number of mechanical and physical tests were carried out for the Forest Pathology Division of the British Columbia Forest Service.

On request of the Royal Canadian Engineers' Training Centre A-6, an inspection was made of folding wooden boats and wooden bridge pontoons to determine the suitability of conditions of storage and the serviceability of the structures.

DIVISION OF TIMBER PRODUCTS

Studies were continued on both hardwood and softwood lumber to determine the comparative moisture pick-up during storage of air-seasoned and kiln-dried stock. An investigation was made of the kiln-drying of broad-leaved maple and of checking during furniture manufacture and in use. The drying of red alder furniture stock in a natural circulation kiln was also studied.

Several hundred Douglas fir indicator sticks for the detection of fire hazard in the forests during the 1946 fire season were prepared, by a new technique developed in California, for the British Columbia Forest Service.

Seasoning with crystal urea of six large Douglas fir discs, approximately four feet in diameter, was undertaken in co-operation with the British Columbia Forest Service in order to provide display specimens for Fouad University, Cairo, Egypt.

A survey was made of all sawmills operating dry kilns in the southern coast area, to determine the extent of corrosion in metal parts so that, if warranted, a study might be carried out in co-operation with the Metals Research Division of the British Columbia Industrial and Scientific Research Council to devise methods for coping with the problem.

An investigation was commenced on the manufacture of sliced aircraft Sitka spruce veneer with a view to reduction of de-grade by finding the best way of conditioning flitches prior to slicing them into veneers.

Calorific determinations were carried out, at the request of Vancouver City and Dominion Government authorities, on certain types of briquetted sawdust and sawdust fuel to establish the heat value of poor quality or wet sawdust sometimes supplied for domestic heating.

Information was assembled for sawmills interested in the use of hydraulic barkers for logs. Samples of bark from floated logs barked by hand and by the hydraulic method were tested to establish the suitability of the waste bark for fuel under mill boilers.

A preliminary survey was made at a number of mills of different outputs to gain an understanding of the different milling practices now employed for logs of different diameters and grades. Two field studies were carried out, one on Engelmann spruce at a mill in the interior of the province, and one on the recovery of sound wood from defective logs milled at a northern Coast mill.

A project was initiated on logging waste with the object of studying, (1) the quality and quantity of material left in the woods after logging, (2) means of logging this material economically and (3) the best methods for manufacturing it into lumber.

For a large creosoting company, microscopic studies were made of sections of Western red cedar poles, in an effort to find the cause of thin and erratic sapwood penetration under full-length creosote treatment.

An investigation was made of Douglas fir lumber containing white-specked heart and intended for house sheathing or concrete forms, in order to advise shippers if this lumber was suitable for the purpose intended and if the decay-producing organism continued to grow in the manufactured product. Assistance was extended to a British Columbia lumber association regarding the extent to which various firm heart-stains such as brown-heart, purple-heart, and red-heart indicate incipient decay and whether firm heart-stain might be acceptable in building grades where strength is not a prime factor.

A study was undertaken on the use of ultra-violet radiation in the detection of incipient decay in Sitka spruce, primarily to determine the possibility of rapid detection in aircraft material of such decay, which might not be visible under ordinary conditions.

A great deal of interest was shown during the year in the possible development of an industry to use waste cedar, hemlock and true fir for the manufacture of insulation blanket and wall-board and information was assembled for several interested firms.

Assistance was extended to officials of the British Columbia Lumber and Shingle Manufacturers' Association in reviewing a proposed revision of popular bulletins on Douglas fir, Western hemlock, and red cedar prepared in 1930 by the Laboratory in co-operation with the British Columbia Forest Service.

Pulp and Paper Research Institute of Canada, Montreal

August 1, 1945, saw the completion of the first five years and the renewal for the next five years of an agreement whereby the re-organized Institute will be operated with the support of the Dominion Government, the Canadian Pulp and Paper Association, and McGill University. The Montreal laboratory of the Forest Products Laboratories is a part of the Institute and is under the General Director who is responsible to the Joint Administrative Committee representing the three partners in the enterprise.

FUNDAMENTAL RESEARCH STUDIES

The synthesis of cellulose mono- and dinitrates, in which the nitrate groups were not distributed at random in the cellulose macromolecule, but occupied definitely known positions, was accomplished.

The oxidation of wood lignin by halogen-containing oxidants was studied. Pyrogallol and vanillin, representing different types of chemical structure present in lignins, were first treated. The oxidation of vanillin by sodium chlorite and by chlorine dioxide yielded results which seemed to show that they operate through different mechanisms.

In an attempt to isolate lignin from wood with as little change as possible, a technique was developed whereby extracted spruce wood was oxidized in such a way that the residual substance, named periodate lignin, retains much of the morphological structure of the wood.

Work has begun to determine the arrangement of hydroxyethyl groups in technical hydroxyethyl celluloses, which are finding use as textile finishes, by studying the tosylation-iodination reaction in the cellosolve series with the object of applying the information so gained to the desired research.

In order to fill a gap in the fundamental knowledge of high-pressure hydrogenation, the stepwise hydrogenation of vanillin over a catalyst was studied.

APPLIED RESEARCH STUDIES

The new optical instrument for measuring the printing smoothness of paper was found to be of considerable use, fulfilling the assumptions made in designing it and permitting results obtained from it, when expressed on a numerical basis, to be representative.

Considerable time was spent in studying air and oil permeability of newsprint. Oil permeability was not constant but varied with conditions in an anomalous way for which no satisfactory explanation has yet been found.

The critical examination of methods of analysing waste liquor was continued. Some modifications were tested and led to improvements in some of the methods, and further tests give promise of further improvements.

The method of measuring the surface area of a pulp by means of its permeability to water was studied. An apparatus was constructed for making a suitable test sheet of pulp. The water used must be free of air. It was found that permeability decreased with continued flow. This was similar to the effect of oil permeability in newsprint.

A study of alkaline pulping was begun with the idea of ascertaining the effects of varying conditions on the resulting pulp. It was found impossible to duplicate mill conditions, however, so the study was limited to finding the effect of liquor concentration on the yield and quality of the pulp produced. No definite conclusions were arrived at, but some interesting trends were indicated. The work is being continued.

As the result of experience in operating the miniature grinder which was designed at the Laboratory several years ago for the study of the technique of making mechanical pulp, several changes were introduced which increased its flexibility and facilitated the reproducibility of results. It is now better suited for the continuation of studies on grinding.

WOODLANDS RESEARCH

A partial study was made of the problem of attaining good restocking of spruce and balsam fir after cutting these trees in the forest. The study of the efficiency of present methods of driving pulpwood in rivers and streams in the spring of each year was completed.

TESTING

Testing work was carried out in connection with studies, involving pulp and paper products, being conducted by government departmental agencies and by committees of the Technical Section of the Canadian Pulp and Paper Association.

The usual amount of testing of samples and checking of instruments was done for the industry.

MAINTENANCE WORK

An opportunity was afforded during the past year of making a number of desirable changes and improvements in the semi-commercial equipment in the mill at the Institute. Replacements, renovations, and adjustments resulted in improved operation.

WAR WORK

Until enemy resistance ceased, continued assistance was given to the Government, which involved the use of special equipment or of special qualifications of the staff.

PUBLICATIONS OF THE LABORATORIES

Circular 61—Cause and prevention of decay in wooden buildings.

Mimeograph

105—Treated and untreated timbers. Complete service tests to date and notes regarding tests in progress.

106—The effect of slant-driving on the holding-power of nails.

107—A literature review of the chemical constituents of bark.

108—Wood hydrolysis at atmospheric pressure.

109—The use of Canadian hardwoods as substitutes for yellow locust for telephone and telegraph top-pins.

V–100—The rusting of cans in wooden and fibreboard boxes.

112—The effect of high temperature on casein and cold-setting urea-formaldehyde glues.