DOMINION OF CANADA

REPORT OF THE DEPARTMENT

OF

MINES AND RESOURCES

INCLUDING

REPORT OF SOLDIER SETTLEMENT OF CANADA

FOR THE

FISCAL YEAR ENDED MARCH 31, 1941

OTTAWA
EDMOND CLOUTIER
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1941

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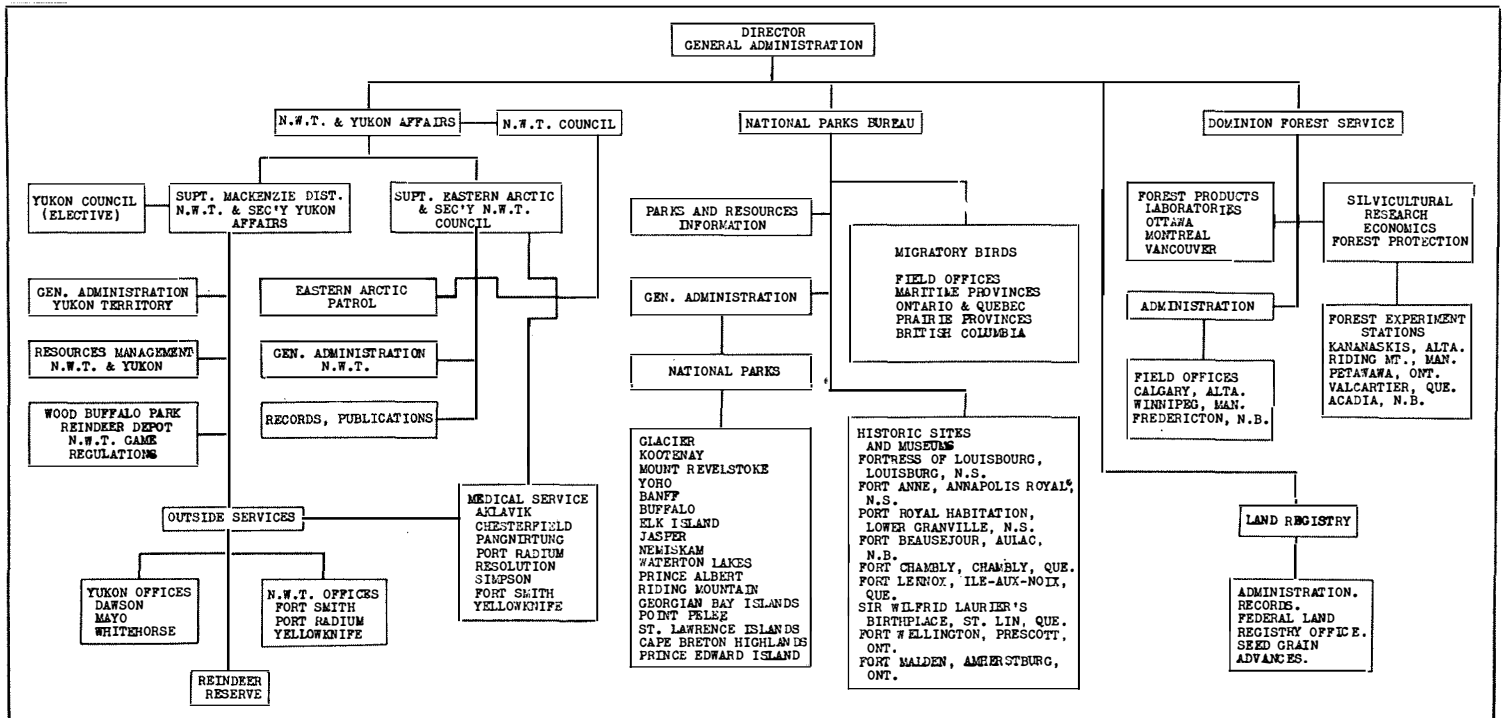
To His Excellency the Right Honourable the Earl of Athlone, K.G., P.C., G.C.B., G.C.M.G., G.C.V.O., D.S.O., Governor General and Commander-in-Chief of the Dominion of Canada.

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the Annual Report of the Department of Mines and Resources, including a Report on Soldier and General Land Settlement, for the fiscal year ended March 31, 1941.

Respectfully submitted,

T. A. CRERAR,
Minister of Mines and Resources.



Organization Chart, Lands, Parks and Forests Branch.

LANDS, PARKS AND FORESTS BRANCH

ROY A. GIBSON, DIRECTOR

During the year the Branch has carried on all essential services and in addition has undertaken various activities that have developed as a result of the war. Only a limited amount of information can be published at present about some of these wartime duties. Many of the permanent, temporary, and seasonal employees of the Branch have enlisted for military service and others have been loaned temporarily to war departments. Owing to these enlistments, loans, and to a number of retirements for the sake of economy, the remaining members of the staff have taken on additional work and responsibility.

Gold production has increased markedly in the Northwest Territories and as a result fur is no longer the commodity of greatest export value. Four properties are now producing gold and further developments are going ahead on other properties.

Gold production in the Yukon Territory is now better organized for steady production over a term of years. The situation with respect to the development of silver-lead deposits is not so promising.

The National Parks report the largest attendance of visitors in their history and the proportion of those coming from the United States is very gratifying. These national playgrounds are a very important factor in attracting visitors from the United States. This is particularly true of the western provinces. Expenditures by United States tourists in this country are an important source of funds for foreign exchange. Not much new work was initiated in the parks, but several developments under way were brought to completion. Several of the Forest Experiment Stations have been used as internment camps and, where possible, the service of the internees have been utilized to make permanent improvements to the roads, camp-grounds, forestry plots, and timber stands. The Forest Products Laboratories rendered essential technical services to the Defence Departments and to the wood-using industries. The Dominion Forest Service worked throughout the year in close collaboration with the office of the Timber Controller.

Care has been taken to conserve the very considerable investment of the Dominion in the various properties administered by the Branch.

It is the consistent policy to seek technical assistance in natural resources administration from other Government departments that are organized to supply same and acknowledgment is made of the ready and efficient co-operation that is secured. Mention should be made also of the assistance furnished by the Royal Canadian Mounted Police in the administration of remote territories.

The accompanying chart shows the plan of operation of the four main bureaux or services. The various activities carried on during the past year, which extend to every part of the Dominion, are outlined more fully in the report that follows.

BUREAU OF NORTHWEST TERRITORIES AND YUKON AFFAIRS

NORTHWEST TERRITORIES

The Northwest Territories comprise that portion of the mainland of Canada lying north of the Provinces of Manitoba, Saskatchewan, and Alberta, 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 official census of 1931 the population of the Northwest Territories totalled 9,723, classified as follows: Indians, 4,046; Eskimos, 4,670; and white inhabitants, 1,007. However, owing to the mining activity that has developed in the Mackenzie District during recent years, the white population has considerably increased, the estimated total being 2,000.

The Northwest Territories Act (Chapter 142, R.S.C. 1927) provides for a Territorial Government composed of the Commissioner of the Northwest Territories, the Deputy Commissioner, and five Councillors, all appointed by the Governor General in Council. The Commissioner in Council has power to make ordinances for the government of the Territories under instructions from the Governor General in Council or the Minister of Mines and Resources, respecting direct taxation within the Territories in order to raise revenue, etc., establishment and tenure of territorial offices and the appointment and payment of officers, maintenance of prisons, municipal institutions, licences, solemnization of marriages, property and civil rights, administration of justice, and generally all matters of a local or private nature in the Territories. The seat of Government is at Ottawa.

Council

Commissioner—Charles Camsell.
Deputy Commissioner—R. A. Gibson.
Members of Council—A. L. Cumming, K. R. Daly, H. W. McGill, O. D. Skelton (deceased), S. T. Wood, H. L. Keenleyside.
Secretary—D. L. McKeand.

Work of Council

Eighteen regular and three special sessions of Council were held during the year. Assent was given to ordinances respecting the adoption of infants and the operation of motor vehicles on highways. Amendments were approved to the Workmen's Compensation; Local Administrative District; Businesses, Callings, Trades and Occupations Licence, and Territorial Liquor Ordinances.

Matters dealt with by Council included: organization and itinerary of Eastern Arctic Patrol; application for permit under Scientists and Explorers Ordinance; Eskimo affairs; relief; hunting and trapping; hospital and medical services; reindeer; radio services; schools, and public works.

Administration

The administration of the various acts, ordinances, and regulations pertaining to the Northwest Territories is supervised by the Director of Lands, Parks and Forests Branch, who is also Deputy Commissioner of the Northwest Territories. For purposes of departmental administration a superintendent has been appointed for the Eastern Arctic and one for Mackenzie District. A departmental agent is stationed at Fort Smith, the first settlement reached by those entering the Mackenzie District by the water route from the south. This officer is also Superintendent of Wood Buffalo National Park, Dominion Lands Agent, Crown Timber Agent, and Mining Recorder, as well as Stipendiary Magistrate and Sheriff.

In view of the development in mining activity in the area north of Great Slave Lake it was necessary to have the office of record for that area located more conveniently to the scene of operations and, therefore, in July 1940, the Sub-mining Recorder at Yellowknife was created Mining Recorder, Agent of Dominion Lands, and Crown Timber Agent for the Yellowknife Mining District, which includes the area formerly constituting the Great Bear Lake Mining District, in which prospecting activity has declined.

Medical Officers

To facilitate medical administration, the Northwest Territories has been divided into medical districts over which Medical Officers of the Department have jurisdiction. These officials are stationed at Fort Smith, Resolution, Simpson, Norman, Aklavik, Yellowknife, Chesterfield, and Pangnirtung. A doctor also accompanies the annual Eastern Arctic Expedition. Owing to the temporary suspension of mining activities by Eldorado Gold Mines, Limited, Great Bear Lake medical district has been included in that of Norman. All doctors have been appointed Coroners and Medical Health Officers under the Public Health Ordinance in order to enforce sanitary and general health regulations. The Medical Officers also have jurisdiction over all hospitals, schools, and Industrial Homes.

Hospitals

A new hospital was opened by the Roman Catholic Mission at Rae. This brings to ten the number of such institutions in operation within the Territories, exclusive of those operated by the mining companies. The regular or public hospitals are operated by the Anglican and Roman Catholic Missions at Fort Smith, Resolution, Hay River, Simpson, Norman, Aklavik (2), Rae, Chesterfield, and Pangnirtung.

The Department has an arrangement with the Missions to treat all indigent whites, Eskimos, and half-breeds at $2.50 per diem. During the year payment to the hospitals totalled $26,889.66 representing 10,755 days' treatment and the maintenance of one chronic invalid on the basis of $200 per annum. This figure does not include payment for special cases for whom separate accounts were rendered. During the year 11 mental and other patients were maintained in provincial institutions at a cost of $4,598.70.

Industrial Homes are operated in conjunction with the hospitals at Chesterfield and Pangnirtung where the aged and infirm are maintained and taught native handicrafts on the basis of $200 per annum. During the year the sum of $2,842.50 was expended under this heading.

The above figures do not include the amounts paid by the Indian Affairs Branch for the care and treatment of Indians.

Schools

Four residential schools are maintained by the Roman Catholic and Anglican Missions at Resolution, Providence, and Aklavik. During the year an average of 122 destitute white, Eskimo, and half-breed children were maintained in these residential schools at a cost of $21,421.99. The Missions also operate day schools within the principal settlements and in addition public schools are operated at Fort Smith and Resolution. During the year 100 pupils attended the day schools and grants totalling $2,250 were paid toward the maintenance of these institutions exclusive of a small amount for school supplies.

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

Transportation

The Northwest Territories are reached by steamer via the Pacific and Atlantic Oceans and by the inland water routes. The aeroplane also plays a very important part in year-round transportation. Scheduled flights are maintained throughout the year, except for a short time during the freeze-up and break-up periods. The Grimshaw-Great Slave Lake winter tractor road is also providing a further means of access.

Communications

The Northwest Territories and Yukon radio system was again operated by the Department of National Defence (Permanent Force). Wireless stations were operated by the Department of Transport. The stations of the former are located at Edmonton, McMurray, and Chipewyan, Alberta; Goldfields, Saskatchewan; Fort Smith, Resolution, Yellowknife, Simpson, Norman, Aklavik, Port Radium (closed July, 1940), and Thompson Lake, Northwest Territories; Dawson, Mayo, Whitehorse, and Burwash Landing, Yukon Territory. The wireless, meteorological, and direction-finding stations operated by the Department of Transport are located at Coppermine, Chesterfield, and Nottingham and Resolution Islands, N.W.T.; Churchill, Manitoba; Port Harrison and Cape Hopes Advance (seasonal), Quebec. Mail for the Mackenzie District and Western Arctic is carried under contract by an air transportation company. The greater portion of the mail consigned to points in the Eastern Arctic is conveyed by the R.M.S. *Nascopie*. The mail service is further supplemented by non-scheduled patrols by the Royal Canadian Mounted Police, missionaries, and other travellers.

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 five Stipendiary Magistrates have been appointed.

Liquor Permits

The Territorial Liquor Ordinance assented to April 27, 1939, with amendments, represents the present basis for the sale of spirituous liquor, wine, and beer in the Northwest Territories. The Saskatchewan Liquor Board, as Territorial Liquor Agent, opened a liquor store at Yellowknife on June 27, 1939, from which liquor is sold under permits issued at the store to eligible persons. Under the arrangements with the Saskatchewan Liquor Board all supplies for the Yellowknife store are provided by the Board on a percentage basis. The net profits arising out of the operation of the liquor store and the proceeds of fines under the Territorial Liquor Ordinance are placed in a special account for territorial purposes. The stipendiary magistrate, Yellowknife, is inspector of the liquor store.

The net profits from the liquor store during the fiscal year ended March 31, 1941, amounted to $31,189.92 and fines under the Territorial Liquor Ordinance to $490, making a total of $31,679.92. Other revenue derived from liquor control amounted to $382, being $82 from the sale of permits issued at Ottawa, and $300 from fines for liquor offences under the Northwest Territories Act.

The principal development during the year was the granting of authority for the sale of beer in licensed premises at the Yellowknife Hotel from August 1, 1940.

During the calendar year 1940, 64 permits were issued at Ottawa, authorizing the importation into the Northwest Territories of 79 gallons of spirituous liquor, 10 gallons of wine, and 6 barrels of beer. A total of 1,162 permits was issued at Yellowknife for the purchase of liquor at the Territorial liquor store. The sales at the store during the calendar year were spirituous liquor 2,346 gallons, wine 378 gallons, and beer 8,944 cartons.

Aids to Navigation

This work was carried out for the Department of Transport under the direction of the departmental agent. Existing aids were maintained at points on the Mackenzie River between the delta of Athabaska River and Great Bear Lake.

Lands and Timber

Lots are disposed of by sale in some of the surveyed settlements to transportation companies, mining companies, traders, and missions in connection with their several undertakings and to settlers for residential purposes. In other surveyed settlements, such as Yellowknife, surface leases are granted for the same purpose. One lot was sold and patented in Good Hope Settlement and one lot in Fort Smith Settlement was covered by a time sale. At Port Radium Settlement, 13 surface leases are in force and at Yellowknife Settlement, 148 such leases have been issued. These leases are for five-year periods.

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 number of such leases in force is 25. Eighteen permits to occupy land during the pleasure of the Department have been granted. There are 5 grazing leases in force, and during the year 6 hay permits were issued under which 78 tons of hay were cut. During the year 26 assignments affecting lands were registered in the Department.

The number of timber permits issued, exclusive of those granted in connection with timber berths, was 103 authorizing the cutting of 82,079 lineal feet of timber, 542 roof poles, 6,000 mine ties, and 3,856 cords of wood. Thirty-seven of these permits were issued free of dues to educational, religious, and charitable institutions, to settlers for domestic use, and to Government departments. Thirteen timber permit berths were granted. The revenue derived from lands, timber, grazing, and hay was $11,657.50, being an increase of $4,151.23 over the previous year.

Mining

To meet the increasing activities in the Yellowknife area, a Mining Recorder's Office was opened at Yellowknife Settlement on July 5, 1940, and on the 23rd of that month the office at Port Radium was closed. Through the Yellowknife office, and the Mining Recorder's office at Fort Smith, the local administration of mineral resources of the Mackenzie District is conducted, Sub-Recorders being located at Edmonton, Alberta, and at Aklavik, Simpson, and Coppermine, Northwest Territories.

The "Con" mine of the Consolidated Mining and Smelting Company of Canada, Limited, was brought into production in September, 1938, and by the end of March, 1941, had yielded gold to the value of more than $2,971,000, of which about $1,255,000 was produced during the year. Production at the company's "Rycon" mine was reached early in 1939 and by the end of the year under review had reached a value of about $209,000, the year's production amounting to more than $152,000. The "Negus" mine, owned by Negus Mines, Limited, commenced production in February, 1939, and reported production of gold to the end of March, 1941, having a value of more than $1,535,000. Several other properties in the area are nearing the production stage.

The Eldorado property at Great Bear Lake, on which ores of radium and silver were discovered in 1930, was closed temporarily in June, 1940, sufficient concentrates being on hand to keep the refinery at Port Hope, Ontario, in operation for several years at the present reduced rate.

Miner's licences issued during the year numbered 178, and 289 such licences were renewed. Entries were granted for 405 quartz mining claims and a large number of claims were renewed by the owners obtaining certificates of work, the number in good standing at the end of the year being 4,690. Final leases have been issued comprising an area of 10,963·89 acres. The total revenue obtained from fees payable under the Quartz Mining Regulations amounted to $17,096.85, including $6,516.65 collected as licence fees.

Coal.—Three coal mining leases are in force, comprising an area of 391 acres. Revenue from fees, rentals, and royalties in connection with coal mining rights during the year amounted to $373.21.

Petroleum and Natural Gas.—Petroleum and natural gas leases affecting lands in the Northwest Territories comprise a total area of 3,173·33 acres. Revenue from this source amounted to $480. Rentals satisfied from drilling credits totalled $1,253.33. Petroleum produced from the wells of the Northwest Company, Limited, below Norman on Mackenzie River, amounted to 17,949 barrels. The refinery unit erected on the company's property continued to operate and produced during the year aviation gasoline, aviation base gasoline, motor gasoline, and light and heavy diesel oil. The addition of this unit resulted in a substantial reduction in the price of gasoline and fuel oil. One oil and gas permit is in force, comprising an area of 212·10 acres.

Dredging.—Two dredging leases are in force in the Northwest Territories, comprising in all 2 five-mile stretches of Grizzly and Bennett Creeks. Revenue from these leases for the year amounted to $140.

Northwest Game Act and Regulations

During the fiscal year the following legislation was enacted:—

P.C. 2490, June 11, 1940, safeguarded the privileges of hunters and trappers in the Northwest Territories by providing that, in the event of their enlistment in the British or Allied Forces, the requirement of continued residence in the Northwest Territories would be suspended until 6 months after their discharge.

P.C. 3879, August 13, 1940, established a closed season until further notice on the trapping of beaver on approximately 14,000 square miles including and surrounding the delta of the Mackenzie River.

P.C. 6484, November 14, 1940, limited the annual catch of marten in the Northwest Territories and Wood Buffalo Park to two (2) in the southern section and Wood Buffalo Park, and twenty (20) in other sections of the Territories. This limit is to be enforced by an individual permit system and to be effective from July 1, 1941.

P.C. 681, January 29, 1941, established Boatswain Bay, on the east coast of James Bay, as a Migratory Bird Sanctuary.

P.C. 1477, March 3, 1941, established the eastern part of Akimiski Island and adjacent islands and waters as a Migratory Bird Sanctuary.

The total area included in reserves established for the protection of the wild life in the Northwest Territories as at March 31, 1940, was 609,877 square miles. This does not include the 13,675 square miles of the Wood Buffalo Park situated in the Province of Alberta.

Wood Buffalo Park.—Regular patrols were maintained by the wardens to determine the range and condition of the buffalo and to ensure their protection and well-being. As is customary each year during November and December, 30 bulls were slaughtered to provide meat for the hospitals, missions, and needy native families in districts adjoining the park. Predator control was maintained to reduce the number of wolves and coyotes which prey on the herds. As a result of flood pressure and ice backing up against it from below during the high water at the time of the spring break-up on the Slave River, the Murdock Dam, constructed in connection with the fur conservation projects in the park, was severely damaged in April, 1940, necessitating additional construction and extensive repairs. These were completed during the summer. The other three dams required some minor repairs but otherwise are apparently satisfactory.

Fur and Game.—Catches of all species of fur-bearers, with the exception of white, blue, and silver foxes, and wolves showed increases during the year. Of these only the reduced number of white fox is of major importance. This species is economically the most important fur-bearer in the Territories and

the reduction from 43,290 in 1939 to 30,215 in 1940 resulted in a considerable loss of revenue to the population. Reports on caribou migrations indicate that in most districts these animals were present in sufficient numbers to meet food requirements of the residents.

The Northwest Territories Game Act and Regulations provide for the establishment and licensing of fur farms but, as is natural in a sparsely populated region where fur-bearers are plentiful in the wild state, the industry has not developed to any extent. At the present time only 8 fur farms are licensed to operate and 2 of these have no stock of fur-bearers. Of the remaining 6, one, established in 1932 and the oldest existing farm in the Territories, is stocked with a considerable number of mink, red and cross fox, and a marten. Three others have a small number of mink or fox. The remaining two are not fur farms in the true sense since there is no attempt to enclose the animals or regulate the breeding. These are the two beaver preserves of the Hudson's Bay Company, operated on Charlton and Akimiski Islands in James Bay. At the commencement of the winter of 1939-40 the beaver were estimated to number 1,020 and trapping was permitted. Two hundred and ninety-eight beaver were pelted and twelve taken alive for release on other preserves. The following spring the beaver population was estimated at 1,214. The Charlton Island Preserve comprises some 90 square miles and it is estimated it will support approximately 2,000 beaver. As a result of the presence of the beaver water levels have risen and there has been an increase in the muskrat population. Akimiski Island is about 900 square miles in area and is considered capable of supporting a beaver population of 10,000 or more. Between 1935 and 1940, 51 beaver from the Charlton Island Preserve were released along the south shore.

Comparative figures of the number of big game animals and birds taken during the licence year ended June 30, 1940, and the average for the 5 years ended June 30, 1939, follow:—

	Year ended June 30		5-year average 1935–39
	1940[2]	1939[1]	
Deer	63	20	29
Caribou	22,151	22,982	11,828
Moose	1,066	1,141	816
Sheep	86	38	53
Partridge	4,053	801	647
Grouse	909	242	185
Prairie Chicken	1,594	2,355	953
Ptarmigan	7,100	7,879	4,977
Ducks	12,956	11,777	7,115
Geese	1,008	911	700

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 1936–40
	1941	1940	
Hunting and Trapping—			
Resident	488	534	496
Non-resident bird licence	20	16	11
Trading and Trafficking—			
Resident	103	124	136
Non-resident British	8	6	7

Permits

	Year ended June 30		5-year average 1936–40
	1941[2]	1940[1]	
To establish trading posts	12	28	27
To take mammals	4	5	2
To hunt and trap in Wood Buffalo Park	333	335	375
To render Migratory Birds Permits operative in N.W.T.	12	12	15
To take specimens	7	13	11
To take quota (15) of beaver	885	1,535	1,410

[1] These figures differ slightly from those recorded in the annual report for 1939-40 due to additional returns received since that report was printed.

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

Revenue under Northwest Game Act for fiscal years ended March 31, 1940 and 1941:—

	Fiscal Year		5-year average 1936–40
	1941	1940	
	$ cts.	$ cts.	$ cts.
Hunting licences	1,153 84	1,313 92	1,762 01
Trading licences	1,899 90	2,775 00	1,972 83
Bird licences	100 00	80 00	41 00
Fur farm licences	23 07	26 00	23 20
Trading Post permits	12 00	28 00	35 85
Sale of furs	454 32	436 78	418 01
Fur export tax	75,819 16	95,848 10	84,868 09
Fines and forfeitures	1,502 64	1,156 17	345 23
Sub-totals	80,964 93	101,663 97	
Revenue under Businesses, Callings, Trades and Occupations Licence Ordinance	4,599 50	4,465 00	
Totals	85,564 43	106,128 97	

Infractions of Game Laws.—There were 28 prosecutions for infraction of the game laws. Convictions were secured in 24 of these cases.

Reindeer

Further progress is reported in the development and extension of the Government reindeer enterprise in the northern Mackenzie District. The annual roundup of the main herd on the reserve near the Mackenzie Delta was completed on July 28, 1940, and the count showed the surviving fawn increase for the year to be 1,486 head. In addition to the fawns there were 2,295 females, 610 males, and 685 steers, a total of 5,076 animals. At the roundup of Native Herd No. 1 near Anderson River in August, 1940, there were 1,559 deer, including 448 fawns.

The annual slaughter of surplus reindeer in the main herd took place on Richards Island in September and on the mainland about the end of November, the total number of animals slaughtered on these occasions being 179, of which 100 carcasses were allotted to the local missions. The total number of reindeer from this herd slaughtered for meat purposes during the fiscal year was about 230, of these 24½ carcasses were sold, from which a revenue of $574.15 was derived.

In December, 1940, a second native herd was started by the separation of between eight and nine hundred animals from the main herd and the transfer of the new herd to a location selected near Horton River, the drive of about 250 miles being accomplished in 12 days.

The General Foreman in his report on field activities during the year indicated that the reindeer were in excellent condition with abundant feed available on both the summer and winter ranges.

The Interdepartmental Reindeer Committee held two meetings.

Eastern Arctic Patrol

The annual Eastern Arctic Patrol sailed from Montreal on the R.M.S. *Nascopie* of the Hudson's Bay Company on July 17. On the homeward voyage a call was made at Ivigtut, Greenland, where a cargo of cryolite was taken aboard. The vessel docked at Port Alfred, Quebec, on October 14, and the personnel of the Patrol returned to Ottawa by train.

D. L. McKeand was again the Officer in Charge of the Government party, which included F. R. E. Sparks, Post Office Department, and Max J. Dunbar, Marine Biologist, Oxford University. Inspector D. J. Martin was in charge of the Royal Canadian Mounted Police party. Doctors M. O. Klotz, J. A. Bildfell, and T. J. Orford acted in turn as Medical Officer and Ship's Doctor.

In view of the state of emergency it was decided to forward as nearly as possible a two-year supply for each of the posts serviced by the *Nascopie* with the result that 667½ tons of Government freight were carried this year. D. L. McKeand, having been appointed Registrar for National Registration in the Eastern Arctic, performed this work with the co-operation of the Royal Canadian Mounted Police, missionaries, and fur traders. The Officer in Charge reported that while there was a scarcity of white fox, the principal fur-bearer trapped in this region; other animals were plentiful and the natives generally were well supplied with food. The Medical Officers reported the general health of the natives at the various ports of call to be satisfactory.

Yellowknife Administrative District

This District, covering an area of 38·48 square miles on the north arm of Great Slave Lake and about 615 miles by air from Edmonton, is managed by a Local Trustee Board of 5 members. During the year 26 Board Meetings were held and 8 By-laws were passed covering such items as health and sanitation, the assessment and collection of taxes on real and personal property, regulations governing boat lights, traffic at the local airport, the operation of motor taxis carrying passengers over the ice, and fire protection measures.

In the local school 2 teachers are maintained and the Alberta curriculum is followed. The Dominion Government makes an annual grant of $1,000 and there is an elected school board of 3 members.

Public Improvement

Winter landing fields, seaplane bases, roads, and fire-fighting equipment were maintained and some additions made to the latter.

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; 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

census of 1931 the total population was 4,230 (2,593 whites, 1,543 Indians, 85 Eskimos, and 9 unspecified). There has been an increase lately in the white population owing to revival of mining activities.

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 General 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.

Territorial Council

Controller, Yukon Territory—G. A. Jeckell, Dawson.
Seat of Government—Dawson, Y.T.

The following is the Yukon Council elected August 27, 1937; Dawson District, John A. McDonald; Whitehorse District, George Wilson; Mayo District, Ernest J. Corp.

Work of Council

The Yukon Council met on June 3, 1940. This was the third and final session of the eleventh wholly Elective Council of the Territory. The Council was prorogued on June 15, 1940.

The Council enacted ordinances providing for the imposition and collection of a tax on income, also on gasoline and fuel oil. In addition an ordinance was passed respecting the practice of chiropractic. Amendments were made to a number of other ordinances.

Election

The triennial election to Council was held on November 25, 1940, the following being elected; Dawson District, Andrew T. Taddie; Whitehorse District, Willard Leroy Phelps; Mayo District, Richard Gordon Lee.

Administration

The Lands, Parks and Forests Branch is responsible for 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; the administration of the Yukon Placer and Quartz Mining Acts; and for the collection of revenue.

The activities of Dominion Government Departments in the Territory involved an expenditure of $466,422.30 during the past fiscal year and the revenue collected in the Yukon amounted to $494,236.54. These figures do not include those for the Department of National Defence. For local purposes the Territorial Government raised $182,034.17, of which amount $110,000 represented the profit from the operation of Government liquor stores.

Lands and Timber

One sale was made; 1 agricultural lease, 4 hay permits, and 1 permit to occupy were granted; 6 renewal leases were issued. There are now in force 22 homestead entries, 8 agricultural leases, 24 waterfront leases, 2 miscellaneous leases, and 17 permits to occupy. The revenue derived from lands amounted to $5,784.27.

One hundred and twelve permits were issued authorizing the cutting of 306,000 feet board measure of saw timber and 19,531 cords of wood, being 4,144 cords more than last year. One permit to cut wood for mining purposes was issued free of dues. Nine licence timber berths were cancelled, leaving 24 in force for which licences were issued. Six timber seizures were made. The total revenue collected from timber was $10,543.92, being an increase of $3,747.93 over last year.

Mining

A slight decrease in placer gold production was noticeable during the year, owing mainly to the early freeze-up. Placer mining operations produced 98,138·51 ounces of gold, the total value of which, at $35 per ounce, is $3,434,847.85. Entries were granted for 171 placer and 84 quartz mining claims staked and applied for during the year and 2,949 such claims were renewed for another year. Nine quartz mining leases were issued during the year comprising in all an area of 376·39 acres, making a total of 5,310·81 acres held under lease.

Gold Royalty.—The total amount collected for royalty on gold obtained from placer deposits up to March 31, 1941, was $5,233,925.55, of which amount $36,802.34 was collected during the year.

Dredging.—Three leases to dredge for minerals in the beds of rivers in the Territory are now in force, comprising a river stretch of about 14½ miles in all. The total rental from this source up to March 31, 1941, amounted to $210,496.87, of which $290.53 was collected during the year.

Hydraulic Mining.—The regulations for the disposal of hydraulic mining locations were withdrawn by Order in Council dated February 4, 1904, but the leases then in force were not affected by such withdrawal. There are still 4 hydraulic mining locations held under lease, comprising a total area of approximately 16 square miles. Rentals amounting to $208,743.50 have been collected on account of such locations, the amount received during the year being $1,382.

Placer Mining

The total number of placer claims in good standing at the close of the year was 2,632, most of which are held by the Yukon Consolidated Gold Corporation, Limited. Ten dredges were operated by this company during the year and these produced 66,760 fine ounces of gold and 14,313 fine ounces of silver. The company employed an average of 430 men, the peak during the operating season being 759, and expended $1,993,000 for salaries, wages, and power. A further sum of $1,035,332 was expended for equipment, supplies, and freight.

The greater part of the 98,138·51 ounces of gold produced during the year was from the Dawson District, the Mayo District producing 1,938·5 ounces, and the Whitehorse District, 907·04 ounces.

Lode Mining

Dawson District.—Entries were granted for 29 quartz claims staked and applied for during the year, and development work was conducted on 116 claims previously staked.

Mayo District.—Operations in this area are conducted mainly by the Treadwell Yukon Corporation, Limited, on the "Calumet" and "Elsa" groups of mineral claims, the mill being located at the "Elsa" camp. During the year, 97·94 tons of crude ore and 4,266·94 tons of concentrates were shipped from this camp, yielding 2,277,569 ounces of silver and 245,488 pounds of lead. The average number of men employed by this corporation was 86 and the ore shipped had a value of $806,086.

Prospecting Leases

Prospecting leases representing a total stretch of 198 miles were issued during the year, comprising locations on several water courses, an increase of 42 miles as compared with the previous year.

Assay Office

The Assay Office was maintained as usual at Keno by the Territorial Government. A total of 1,029 samples of rock for assay were received from all parts of the Territory, and 1,640 assays or quantitative analyses were made. In addition, numerous qualitative determinations and chemical tests were made in connection with the identification and classification of the various rocks and minerals of which no record was kept. The assays made were gold and silver, 1,029; lead, 604; copper, 3; antimony, 2; and tungsten, 2.

Roads and Bridges

Expenditures on the maintenance of the road system out of Territorial funds were $50,050.57, a decrease of $729.37 from the previous year. Work was confined to maintenance of the roads most used. A new landing barge for the ferry used at Dawson was purchased at a cost of $3,650. All road equipment was repaired and kept in good condition. A Special Grant of $15,000 was received from the Federal Vote for mining roads, from which the sum of $11,637.59 was expended.

Development of Aircraft Landing Facilities

A total expenditure of $5,798.28 was made to maintain and improve existing landing fields. Of this amount, $2,436.31 was from Territorial Government Funds, the balance from the Federal Vote for mining roads. The most important fields, namely, at Dawson, Whitehorse, Mayo, and Carcross, were extended and improved, and work was also done on the secondary fields at Carmacks and Flat Creek. In addition to the above the White Pass and Yukon Route constructed, at its own expense, emergency landing fields at Fox Lake, Little Salmon, Yukon Crossing, and Grand Valley, all on the regular routes from Whitehorse to Mayo and Dawson.

Agriculture

The summer of 1940 was favourable for vegetable crops, and there was a marked increase in production. Hay and grain fodder crops were good, and weather conditions were favourable for cutting and curing. It is quite noticeable at the present time in the Dawson area that much more ground is being prepared for vegetable crops than in previous years.

Fur and Game

The net collections made under the Fur Export Tax Ordinance amounted to $9,389.50, an increase of $527.81. A considerable increase is shown over the previous year in beaver, marten, mink, muskrat, otter, and weasel. Coyote, all kinds of fox, lynx, and wolverine show a decrease.

The number of coyote pelts dropped from 1,080 for the previous year to 299. Wolf pelts increased from 266 to 279.

Public Welfare

The general health of the public of the Territory was good. Hospitals were operated at Dawson, Mayo, and Whitehorse, grants for their maintenance being provided by the Yukon Council. The numbers of hospital days of patients for the year were: Dawson, 13,425; Mayo, 1,716; Whitehorse, 2,010; the numbers of hospital days for indigents were: Dawson, 7,947; Mayo, 200. Whitehorse, 279.

Education

Schools were maintained during the year at Dawson, Whitehorse, Carcross, Mayo, and at the "Elsa" camp on Galena Hill. The enrolment of pupils for the year was 270 and the number of teachers employed was 10.

Law and Order

Law and order have been well maintained throughout the Territory by the Royal Canadian Mounted Police, and the local administration has received the co-operation of the police at all times.

LAND REGISTRY

The Land Registry maintains a Central Office of Record of lands under the control of the Dominion; administers Ordnance and Admiralty lands, Dominion owned public lands, certain Dominion lands on which advances have been made under the Soldier Settlement Act, and timber and grazing on Soldier Settlement charged lands and military reserves; issues Letters Patent, and, in conjunction with the different western provinces, adjusts Seed Grain, Fodder and Relief indebtedness.

Central Office of Record

It has been found that the inventory of Dominion-owned lands, maintained in the Land Registry, is each year becoming increasingly used by the other Government departments and the general public as they become aware of this convenient method of obtaining information regarding the ownership of properties. There are 5,440 parcels of land listed, showing the situation, area, and controlling department.

Ordnance and Admiralty Lands

Ordnance and Admiralty lands are those areas in the Maritime Provinces, Quebec, Ontario, and British Columbia which were acquired by the Crown because of their strategic situation. When no longer required for the purpose for which they were obtained, they are transferred to this Department to administer, and they are wherever possible, made revenue producing, usually by leasing. The administration of these lands requires investigations; appraisals surveys; searches of titles; preparation of plans, leases, and reports; and collection of rentals. To assist in economical administration much of the field inspection work has been done in late years by the officers of Soldier Settlement when in the vicinity of the property regarding which a report is required. During the year investigations were made at 5 places in Nova Scotia and New Brunswick, 8 places in Quebec, 9 in Ontario, 2 in Alberta, and 2 in British Columbia.

Surveys.—Surveys were made at Levis, and Point aux Trembles, Quebec. There were 34 leases and permits issued during the year and 18 sales effected. The revenue amounted to $39,488.30.

Public Lands

The revenue from Public lands, $14,238.86, consisted chiefly of rents and amounts received on account of purchases.

Soldier Settlement Charged Lands

The unpatented lands against which charges under Soldier Settlement Act are registered, remain vested in the Dominion. There are 183 quarter-sections of such lands comprising approximately 29,280 acres spread over the four western provinces.

Letters Patent are issued to entrants who have completed the duties in accordance with the terms of the Dominion Lands Act and who have paid their indebtedness to the Soldier Settlement of Canada. In cases where duties are completed but this indebtedness not repaid, Letters Patent are issued in the name of the Director of Soldier Settlement of Canada under the authority of the provisions of Section 27 of the Soldier Settlement Act, and the amendment of 1931.

Timber and Grazing

Grazing.—During the year 9,600 acres were covered by 5 annual grazing permits on quarantine reserves along the southern boundary of Saskatchewan and Alberta. This was an increase of 2,745 acres as compared with last year. In the summer grazing season of 1940 there were 176 cattle, 146 horses, and 255 sheep grazing on these lands. The revenue, consisting of rent, amounted to $233.10.

Timber.—Within the boundaries of the National Parks there are 11 licence timber berths, covering a total area of 65·90 square miles; 2 of these berths are in the Province of Manitoba and 9 in British Columbia. During the year licences in duplicate were prepared for these berths, and 4 assignments were registered. The revenue amounted to $6,353.68, being $2,572.18 more than the preceding year. Additional fees of $2 were collected for permit berths on Dominion lands in British Columbia.

Within this period 43 accounts, covering timber permits issued to homesteaders by the Dominion before the transfer of the natural resources, were verified for the western Provincial Governments, and letters of inquiry reaching this Administration from prospective settlers relative to the acquiring of various privileges on lands now under the jurisdiction of the Provincial Governments were placed in their proper channels. Briefly, this Administration still continues to act as the channel for settlement inquiries.

Seed Grain, Fodder, and Relief Indebtedness

The last payment in connection with advances of relief, including fodder for animals, made to settlers by the provinces under an agreement between the Dominion and the Provinces of Saskatchewan and Alberta in 1919 and renewed in subsequent years, was made in 1940, and amounted to $78,871.62.

In the year 1927, an Act 17 George V Chapter 51, was passed, authorizing the Governor in Council to make regulations providing for apportionment and adjustment of indebtedness. During the past year 1,218 recommendations were submitted by the different seed grain, fodder, and relief adjustment boards. Their recommendations were ratified by Orders in Council. A total of 720 discharges and 418 partial discharges were issued and the amount of $120,910.77 was written off. The Provincial Governments asked for information regarding indebtedness against lands for which they proposed to issue grants in 1,748 cases and 188 certificates of indebtedness were issued to be attached to title. Statements of accounts and letters totalling 317 were sent Official Receivers, Registrars, and Boards of Review, under the Farmers' Creditors Arrangement Act in Alberta and Saskatchewan; and the various Debt Adjustment Boards and Land Utilization Boards, forwarded some 3,590 inquiries.

The gross collections for the year amounted to $15,938.75, an increase of $7,186.09. The sum of $418.33 was refunded leaving a net revenue of $15,520.40. The following summary shows the financial operations for the year ended March 31, 1941:—

——	Principal	Interest	Total
Debits	$ cts.	$ cts.	$ cts.
Balance outstanding, March 31, 1940	2,884,285 24	3,317,853 82	6,202,139 06
Accrued interest, April 1, 1940, to March 31, 1941	.....	169,230 91	169,230 91
Total Debits	2,884,285 24	3,487,084 73	6,371,369 97
Credits			
Net Revenue—April 1, 1940, to March 31, 1941	11,191 25	4,329 15	15,520 40
Amount written off—as loss by Orders in Council (Sec. 2, Chap. 51, 17 George V), and includes items written off under the Farmers' Creditors Arrangement Act, 1934	46,059 38	74,851 59	120,910 97
Amount collected and retained by Province of Saskatchewan as Commission Clause 18, Natural Resources Agreement with Province of Saskatchewan	.....	40 91	40 91
Total Credits	57,250 63	79,221 65	136,472 28

Summary

Debits	2,884,285 24	3,487,084 73	6,371,369 97
Credits	57,250 63	79,221 65	136,472 28
Amount outstanding March 31, 1941	2,827,034 61	3,407,863 08	6,234,897 69

Letters Patent

During the year there were 20 Letters Patent issued covering a total of 2,801 acres, divided among the Provinces of Manitoba, Saskatchewan, and Alberta, and the Yukon Territory. There were 215 certified copies of Letters Patent issued for which the Department received $590.

NATIONAL PARKS BUREAU

The National Parks are dedicated to the people of Canada for their benefit, education, and enjoyment, to be maintained and made use of, so as to leave them unimpaired for the enjoyment of future generations.

The need for recreation, or change of interest and environment, both mental and physical, is an accepted principle for a well-balanced existence. The National Parks in providing this recreation make a real contribution in maintaining the country's morale, and through the attractions they offer to visitors from the United States are a means of providing additional foreign exchange.

It can be expected that the National Parks will play an important role in the days of post-war reconstruction.

Administration

The National Parks are administered under the authority and provisions of the National Parks Act (20-21 George V. Chap. 33), sundry Provincial Agreements, and the National Parks Regulations. The Act also covers the National Historic Parks, set aside to commemorate historic events or to preserve national sites and monuments. In this phase of its work, the Bureau is advised by the Historic Sites and Monuments Board of Canada, an honorary body composed of a number of recognized historians.

In addition to the care and control of wild life within the parks, the Bureau also administers the Migratory Birds Convention Act.

Growth of National Parks

Approval of national ownership of park areas is evidenced by the substantial increase in their number and extent in little more than half a century. Instituted in 1885, when the Dominion Government set aside a scenic area of 10 square miles surrounding the hot mineral springs at Banff, Alberta, these parks now number 17, and have a total area of over 29,000 square miles. This figure does not include the National Historic Parks.

A list of the National Parks appears below, arranged in order of their establishment, together with brief descriptive notes.

1. *Banff, Alberta.*—Magnificent scenic playground in central Rockies. Noted resorts, Banff and Lake Louise. Summer and winter sports centre; golf, big game sanctuary. Established 1885; area, 2,585 square miles.

2. *Glacier, British Columbia.*—Superb alpine region in heart of Selkirk Mountains. Snow-capped peaks, glaciers, luxuriant flora. Established 1886; area, 521 square miles.

3. *Yoho, British Columbia.*—On west slope of Rockies. High peaks, beautiful lakes, Yoho and Kicking Horse Valleys. Established 1886; area, 507 square miles.

4. *Waterton Lakes, Alberta.*—Canadian section, Waterton-Glacier International Peace Park. Mountain playground with colourful peaks, varied flora and fauna; golf. Established 1895; area, 220 square miles.

5. *Jasper, Alberta.*—Immense playground and game sanctuary. Majestic peaks, ice-fields, beautiful lakes and famous resort, Jasper. Summer and winter sports; golf. Established 1907; area, 4,200 square miles.

6. *Elk Island, Alberta.*—Fenced preserve containing large herd of buffalo; also deer, elk, and moose. Recreational and camping resort; golf. Reserved 1906; established 1913; area, 51·2 square miles.

7. *St. Lawrence Islands, Ontario.*—Mainland area, and thirteen islands in "Thousand Islands" group with recreational facilities. Reserved 1904; established 1914; area, 185·6 acres.

8. *Mount Revelstoke, British Columbia.*—Rolling mountain-top plateau on west slope of the Selkirk Mountains. Accessible by motor road. Established 1914; area, 100 square miles.

9. *Point Pelee, Ontario.*—Recreational area on Lake Erie, with fine beaches and unique flora. Most southerly portion of mainland of Canada. Resting point for migratory birds. Established 1918; area, 6·04 square miles.

10. *Kootenay, British Columbia.*—Encloses Vermilion-Sinclair section of Banff-Windermere Highway in Rockies. Broad valleys, deep canyons, hot mineral springs. Established 1920; area, 587 square miles.

11. *Nemiskam, Alberta.*—Fenced preserve for prong-horned antelope. Reserved 1915; established 1922; area, 8·5 square miles.

12. *Wood Buffalo, Alberta, and N.W.T.*—Immense region of forests and open plains west of Slave River between Athabaska and Great Slave Lakes. Large herd of buffalo and other big and small game. Established 1922; area, 17,300 square miles.

13. *Prince Albert, Saskatchewan.*—Forested lakeland interlaced with numerous streams. Summer resort and recreational area; golf. Established 1927; area, 1,494 square miles.

14. *Riding Mountain, Manitoba.*—Playground and game preserve on summit of Manitoba escarpment. Summer resort and recreational area; golf. Established 1929; area, 1,148 square miles.

15. *Georgian Bay Islands, Ontario.*—Thirty islands in Georgian Bay. Unique formations on Flowerpot Island. Recreational area. Established 1929; area, 5·37 square miles.

16. *Cape Breton Highlands, Nova Scotia.*—Rugged Cape Breton Island coastline with mountain background. Fine seascapes from highway; golf. Established 1936; area, 390 square miles.

17. *Prince Edward Island.*—Strip 25 miles long on north shore of island province. Recreational area with fine beaches; golf. Established 1937; area, 7 square miles.

In addition, there is Buffalo National Park in Alberta. This was established in 1908, and has an area of 197·5 square miles. At present it is at the disposal of the Department of National Defence, and the larger mammals have been removed.

The National Historic Parks are described later under a special section.

Revenue

For the fiscal year 1940-41, the gross revenue from the National Parks and from administration of the Migratory Birds Convention Act amounted to $393,012.55 and $534.12 respectively. This compares with figures of $390,505.36 and $1,065.28 for the previous fiscal year, or a combined net increase of $1,976.03.

Public Use of the Parks

There was an 18 per cent increase in the number of visitors to the National Parks as compared with the previous year. Details as to individual parks are given in the following table. Four of these areas were raised to the status of National Historic Parks during the year, and previous attendance records are not available. On the other hand, Buffalo National Park was closed for the present fiscal year.

National Park Visitors

National Parks	1940-41	1939-40
Banff	282,851	235,509
Buffalo	.....	22,006
Cape Breton Highlands	20,151	22,035
Elk Island	49,977	53,821
Georgian Bay Islands	3,157	9,677
Glacier	941	1,200
Jasper	91,057	23,115
Kootenay	73,562	62,063
Mount Revelstoke	9,025	7,500
Nemiskam	14	30
Point Pelee	107,833	134,242
Prince Albert	30,090	27,367
Prince Edward Island	35,665	35,488
Riding Mountain	163,230	129,846
St. Lawrence Islands	16,650	21,600
Waterton Lakes	114,578	108,527
Yoho	112,325	67,539

(Continued on Page 80)

National Park Visitors—Continued

National Historic Parks	1940-41	1939-40
Fort Anne	11,321	17,116
Fort Beausejour	12,488	16,589
Fort Chambly	9,345	.....
Fortress of Louisbourg	10,879	.....
Fort Wellington	8,852	.....
Port Royal	6,662	.....
Total	1,170,653	995,270

EVENTS OF INTEREST

One of the main purposes of the National Parks is to provide healthful recreation for visitors both from home and abroad. To many the satisfaction afforded by the scenery, the trees and flowers, the wild life, the invigorating air, is sufficient in itself. Others appreciate more strenuous or more organized forms of recreation enjoyed individually or collectively in a natural environment.

No attempt will be made to enumerate the various forms of recreation to be had in the National Parks. However, certain of the more outstanding activities for this year are given below.

Banff National Park

The Banff Winter Carnival, always a popular feature, drew a record attendance. Nearly 6,000 visitors came by motor car from many parts of Canada and the United States, and others arrived by rail. Colour was added to the sports events by entries of the Australian and New Zealand airmen. The Carnival was held from February 13 to 15 inclusive and the proceeds were donated by the local committee to the "Spitfire Fund."

Ski-ing was a well patronized sport, both at Mount Norquay, where there is a newly installed ski tow, and at the high-country ski lodges.

From July 26 to 30 the annual 5-day outing was held by the Trail Riders of the Canadian Rockies, the route travelled being from Marble Canyon to Lake Louise through parts of Banff, Yoho, and Kootenay Parks. The Sky Line Trail Hikers' annual meet centred around Egypt Lake. The Alpine Club of Canada held its 1940 camp at Glacier Lake, from which base several neighbouring peaks were climbed, and Youth Hostellers were provided with accommodation in the Spray Valley.

On July 17 the neighbouring Indians gathered for "Banff Indian Days". Advantage was taken of their presence to provide scenes for a moving picture produced by Mr. Michael Powell of Great Britain, through the co-operation of the British and Canadian Governments.

The Banff School of Fine Arts, a co-operative project by the Department of Extension of the University of Alberta and the Provincial Institute of Technology and Art, Calgary, held its Eighth Annual Summer Course in the park during the month of August.

Other facilities of the park were well patronized. The museum was visited by 30,004 people, an increase of 7,653 over the previous year, and the hot mineral springs on the slopes of Sulphur Mountain were made use of by 54,387 bathers, being 7,484 in excess of last year's attendance.

Jasper National Park

The Jasper Junior Chamber of Commerce held a two-day carnival in August for the purpose of raising funds for the construction of a swimming pool. This carnival was very successful and provided a very satisfactory start for this fund. The bath-house at Miette Hot Springs was patronized by 15,261 bathers, an increase of 5,284 over the previous year.

The Totem Pole Golf Tournament held the first week in September each year brought such a large attendance that for future years a limit to the number of entrants has been fixed. This week has become the most active period at Jasper Lodge.

The annual Winter Carnival took place on January 16 and 17 under favourable weather conditions and proved an enjoyable event. An exhibition of fancy skating was staged by the Glenora Club of Edmonton. The annual Bonspiel of the Jasper Curling Club, in which many outside rinks participated was held on January 22, and on March 8 and 9 the Northern Alberta Ski Championships took place.

Mount Revelstoke National Park

This park is one of the best known ski-ing centres in Western Canada. The winter tournament of the local ski club was held on February 18 and 19.

Kootenay National Park

The bath-house at Radium Hot Springs was used by 28,303 bathers, an increase of 3,243 over the previous year.

Elk Island National Park

A successful tournament was held on August 11 by the Elk Island Park Golf Club. Recreational facilities, such as swings, see-saws, checker boards, horse-shoe pitches, and a base-ball diamond, have now been completed and are much in use.

Prince Albert National Park

The golf course was as usual the major attraction, and the Annual Lobstick Golf Tournament had a record attendance, 206 players participating. There were large entries for the Junior and Juvenile Tennis Tournaments which were played on July 6 and 7. Unfortunately the Ninth Annual Tennis Tournament had to be cancelled on account of rain. The Annual Swimming Regatta held on July 27 was well attended. Some 4,200 persons visited the museum.

Riding Mountain National Park

The Seventh Annual Tennis Tournament was held during August and was considered the most important hard court tournament in Manitoba. The Wasagaming Golf Tournament was played during July, with an entry of over 130 players. During the month of July, an annual regatta was put on by the Wasagaming Board of Trade and proved a great attraction. The annual Girls' Softball Tournament was held during August, as well as the Annual Horse Shoe Pitching Tournament.

PUBLIC RELATIONS

Press Contacts

The Canadian press and periodicals gave outstanding co-operation in the publishing of news and information on the National Parks. Special articles appeared in 260 different newspapers and magazines. Articles were also

distributed in the United States of America to publications carrying advertising of the Canadian Travel Bureau. Material was furnished to many writers and other individuals engaged in press and publicity work.

Additional press publicity was obtained through the Canadian Resources Bulletin, a weekly news sheet issued by the Department. One or more current news items and facts of interest about the National Parks appear in each issue. Copies are sent to every important newspaper in Canada and the United States, and to many writers. The total mailing list is 2,700 copies.

Parks Literature

To meet the demands for literature descriptive of the National Parks and Historic Sites, 443,000 copies of publications were printed during the year. Included in these were two new booklets—"Playgrounds of the Prairies" and "Playgrounds of Eastern Canada"—part of a series which describe the parks by groups according to their geographical location. In addition 100,000 copies of an illustrated folder were printed for distribution at the 1940 New York World's Fair.

Material sent out during the year comprised 574,259 copies of parks literature, 15,876 copies of the "Canada Descriptive Atlas," and approximately 16,500 copies of maps and other pamphlets printed by private enterprise. These were distributed to tourist agencies, transportation companies, automobile associations, Boards of Trade and affiliated organizations, as well as to educational institutions and individuals. In addition, copies were made available in the National Parks, many of which contain information bureaux.

A list of the publications printed for the Publicity Division during the year follows:—

	Copies
The Banff-Jasper Highway (Descriptive Booklet)	50,300
Banff National Park (General Information Folder)	25,000
Elk Island National Park (Descriptive Booklet)	25,000
Elk Island National Park (General Information Folder)	25,000
Kootenay, Yoho, Glacier and Mount Revelstoke National Parks (General Information Folder)	25,000
National Parks of Canada (Descriptive Illustrated Folder)	103,600
Playgrounds of Eastern Canada (Descriptive Booklet)	75,000
Playgrounds of the Prairies (Descriptive Booklet)	78,100
Prince Edward Island National Park (General Information Folder)	25,000
Sport Fishing in Canada's National Parks (Descriptive Booklet)	10,000
Catalogue of National Parks Motion Picture Films (No. 5)	1,000
Total	443,000

Films and Lantern Slides

A continued demand for National Parks motion picture films, particularly from travel associations and educational institutions, resulted in a circulation of 4,349 prints. These went out largely to different parts of Canada and the United States, but also reached Great Britain, Australia, South Africa, New Zealand, and Alaska. The reported attendance at showings of National Parks films during the year was 3,052,904 persons.

Park films were shown several times a day in the cinema operated by the Canadian Government at the New York World's Fair. The film library now contains 95 subjects in 16-mm. size, and 88 subjects in 35-mm. size, descriptive of the scenic, recreational, and wild life aspects of Canada's National Parks.

During the year two subjects were produced in 16-mm. Kodachrome film; these were, "The Banff-Jasper Highway" and "Along the Cabot Trail." In addition, a sound film entitled "The Royal Parks" was produced with the co-operation of the National Film Board.

The demand for lantern slides continued, and 3,106 slides were lent to educators and lecturers, together with suitable lecture notes. The library stock was augmented by 189 slides and a large number of existing slides were retouched and remounted.

Illustration Material

Additions to the photographic library included 290 new negatives and 6,312 prints and enlargements. A total of 3,629 photographs and enlargements were distributed for publicity purposes, and 488 half-tone engravings and line-cuts, together with 130 matrices were lent to editors, publishers, and publicity organizations. Sixty-seven photographic enlargements and 162 translites and transparencies were coloured during the year.

Parks Exhibits

An appropriate exhibit was again shown in the Canadian Pavilion at the 1940 New York World's Fair, and co-operation was given to the Canadian Travel Bureau in maintaining a travel information service in the above pavilion. The National Parks Bureau was represented by a specially designed exhibit in the Railway Building at the Canadian National Exhibition, Toronto, which was awarded a gold medal by the Exhibition Association. National Parks photographs, translites, and other material were on view also in Travel and Sportsmen's shows at New York, Cincinnati, Detroit, and Indianapolis.

General

An important conference at Spokane, Washington, held under the auspices of the Pacific Northwest Tourist Association was attended by the Superintendent of Publicity, who also delivered addresses and lectures in many parts of Canada. The Minister issued a special, written invitation to our "Good Neighbours to the South" to visit Canada and include in their itinerary the National Parks. This letter was attached to all correspondence addressed to points in the United States.

MAINTENANCE AND IMPROVEMENTS

This included the maintenance of motor highways and secondary roads, trails, bridges, buildings, and recreational facilities; general maintenance and operation of electric light, telephone, water, and sewage systems; maintenance of streets and sidewalks; collection and disposal of refuse; and mosquito control in the park townsites.

The following table shows the mileage of roads, trails, and telephone lines within the National Parks as of March 31, 1941:—

Region	Roads			Trails	Telephone Lines
	Motor	Secondary	Total		
Banff National Park (including Lake Louise end Banff-Jasper Highway)	187·2	49·5	236·7	755·0	266·5
Cape Breton Highlands National Park	30·0	24·9	54·9	15·0	.....
Elk Island National Park	16·0	2·0	18·0	4·0	16·0
Glacier National Park	.....	6·0	6·0	109·0	1·5
Jasper National Park (including Jasper end Banff-Jasper Highway)	145·0	9·0	154·0	554·0	372·0
Kootenay National Park	61·1	8·0	69·1	152·7	60·0
Mount Revelstoke National Park	18·0	.....	18·0	30·5	10·75
Point Pelee National Park	10·5	.....	10·5	.....	.....
Prince Albert National Park	69·0	75·8	144·8	390·0	151·0
Prince Edward Island National Park	6·7	2·8	9·5	.....	.....
Riding Mountain National Park	50·2	70·0	120·2	119·0	60·5
Waterton Lakes National Park	28·2	25·0	53·2	243·2	60·5
Yoho National Park	44·5	6·0	50·5	194·0	50·0
Total	666·4	279·0	945·4	2,566·4	1,048·75

During the year one improvement of special interest was the application of calcium chloride treatment for dust-laying and road surface consolidation on 14 miles of highway in Banff Park.

New Construction

Several important projects were commenced or completed during the year. The Banff-Jasper Highway, which unites the two largest mountain parks, was completed and opened for regular tourist traffic on June 15, and additional roadside facilities were provided. In Jasper Park, approach roads were constructed to a new bridge built by the Canadian National Railways over the Athabaska River at Jasper. A new road was provided from this point to Maligne Canyon and Jasper Park Lodge. Increased accommodation for visitors to this park was also obtained through the building of bungalow camps by concessionaires. At Waterton Lakes National Park, hard surfacing on the Chief Mountain Highway was completed, and in Cape Breton Highlands National Park, heavy road construction on the Cheticamp-Pleasant Bay section of the Cabot Trail was successfully undertaken, thereby eliminating the most dangerous and difficult portion of this road, and at the same time greatly enhancing the scenic value of the park for visitors.

The golf links at Cape Breton Highlands and Prince Edward Island National Parks were also finished and opened for regular play. At the latter the first 9 holes were open throughout the season, and the second 9 were available by August 15. Tennis courts were completed at Dalvay during May. The Provincial Government of Nova Scotia installed a diesel-electric power plant at the eastern entrance of Cape Breton Highlands National Park, and also provided tourist accommodation there by the construction of a hotel chalet named the Keltic Lodge.

At the request of the Minister of Munitions and Supply, permission was given to the Calgary Power Company to increase the storage facilities of Lake Minnewanka and to construct a hydro-electric development at Anthracite, both areas being inside Banff National Park. The additional power so provided is urgently required for war industry. Work was commenced on the project before the end of the fiscal year. The company is taking over the existing Government power plant and will provide power to Banff townsite. In this connection the park section of the high-tension line from Canmore was completed.

Other items of construction in the parks are briefly summarized below:—

Telephones

Eighteen miles of forest telephone line were reconstructed at Banff, and aerial masts were prepared for radio telephone and 15-watt Marconi transmitters installed in Cape Breton Highlands Park.

Roads and Bridges

Considerable work was done on the extension and grading of secondary roads and trails in Banff, Jasper, Kootenay, and Mount Revelstoke Parks. In most cases these will serve the dual purpose of opening up new scenic areas and of aiding in fire protection. Additions were made to motor roads in Cape Breton Highlands Park and Prince Edward Island Park; relocations were made in Kootenay Park, and seal-coating was completed on the hard-surfaced road in Riding Mountain National Park.

A new steel and concrete bridge was built across Corral Creek in Banff Park, a floating footbridge was constructed at Elk Island to replace one damaged by ice, and two bridges were replaced by galvanized iron culverts in Kootenay Park. Several trestles were completed in Cape Breton Highlands

Park, and a footbridge was constructed there to facilitate fishing. A footbridge was also built over the Vermilion River in Kootenay Park. Six wooden culverts were replaced by galvanized iron pipe and a rustic footbridge was built in Prince Albert Park.

Buildings

Buildings completed in Jasper Park included a warden's shelter at Medicine Lake and fire equipment sheds. A warden's cabin and a workshop and stable were built in Glacier Park. In Prince Edward Island Park a golf club-house and equipment storehouse were built.

General Improvements

Additional guard rails, embankment protection works, and rustic signs were constructed in practically all parks for the protection of traffic. Tourist camp and picnic facilities were improved and increased at the various parks and in Point Pelee Park a considerable portion of the park was fenced.

Private Enterprise

In Mount Revelstoke Park the new Heather Lodge on the summit of the mountain was completed and opened for visitors. This has accommodation for 16 persons and caters principally to ski-ing parties. In Prince Albert Park 6 additional cabins were built at the Bungalow Camp, making a total of 45. These were constructed by the concessionaire. Additional foundations were laid and a cottage completed on approved plans. A new residence and an apartment building were completed at Waterton Lakes Park, and another building converted into apartments. A dining-room and store at a bungalow camp, and improvements to other accommodation were also completed.

CONSERVATION

Forest Protection

The forests form a living background of Canada's National Parks. They regulate stream flow and thus maintain the water levels in the lakes and streams, so essential to recreational development and fish life; they provide shelter for wild animals and birds; their scenic value is inestimable. The protection of these forests from fire therefore constitutes the first and most important phase of park development and management. Numerous fires are due to natural causes such as lightning, but some 84 per cent are caused by human carelessness. To offset this threat of forest desolation provision must be made in the National Parks for the following:—

(1) A lookout system to detect such fires while they are small and controllable;

(2) The location of a strategic network of roads and trails to afford quick access to fire out-breaks;

(3) The employment of highly specialized equipment in the hands of trained personnel to extinguish such fires. These are the items which go to make up an efficient fire protection organization, and are being provided increasingly each year by a program which in the course of the next few years will enable the Department to cope with an ever-increasing fire-hazard in the National Parks of Canada.

In Riding Mountain and Prince Albert Parks networks of steel towers connected by telephone or radio, and occupied by lookout men, have now been completed to give adequate coverage to these areas. In the western mountain

parks a provision is being made for similar detection facilities there. In all National Parks, road and trail construction continues to give greater means of access to outlying parts of these areas for fire protection purposes.

Fire-weather recording stations have been established in each park. These stations obtain daily records of precipitation, evaporation, relative humidity, temperature, and wind velocity, from which factors a day by day record of the fire hazard is computed. This information furnishes the park officers with a reliable measure of fire hazard on a given day and a forecast of what to expect the following day. With such knowledge the protection forces can be distributed to best advantage. In periods of high or extreme hazard all the regular personnel, including work crews, are warned to be on the alert for fire emergency. During periods of low or nil hazard, these forces can be detailed to construction work or other parks duties without fear of interruption for fire duty.

The fire season of 1940 was one of the most serious experienced in the western parks for some years. Sub-normal precipitation and extended periods of drought resulted in many fires. In the National Parks of Eastern Canada the situation was more favourable, owing to weather conditions. A total of 104 fires occurred, which burned over an area of 186,362 acres inside the National Parks, as compared with 120 fires in a burned area of 113,207 acres in 1939. The smaller number of fires and the larger area burned during the current year give some indication of the high hazard conditions which prevailed throughout the greater part of the season.

Fire losses by parks in the fiscal year ended March 31, 1941, compared with losses for the preceding year, are given in the following table:—

Fire Losses in National Parks

Park	Number of Fires	Area Burned Acres		Cost of Suppression	
		1939	1940	1939	1940
				$	$
Banff	21	3	8,885	341.65	20,133.58
Buffalo	1	.....	125	.....	24.50
Cape Breton Highlands	.....	85	.....	195.03	.....
Glacier	1	.....	spot	.....	.....
Jasper	3	spot	to	40.84	23.65
Kootenay	3	.....	spot	27.17	53.07
Mount Revelstoke	4	2,215	2,904	9,327.62	6,725.58
Prince Albert	22	86	123,705	301.51	20,299.54
Riding Mountain	42	10,817	50,718	5,378.79	9,358.11
St. Lawrence Islands	.....	spot	.....	2.50	.....
Waterton Lakes	4	.....	spot	151.18	91.35
Yoho	3	.....	25	11.75	780.98
Total	104	13,206	186,362	15,778.04	57,490.36

Insects may cause severe damage to forest cover as well as fire. With this fact in mind, the Bureau maintains close co-operation with the Division of Entomology of the Department of Agriculture and assists in the collection of insects for the annual "Forest Insect Survey". Specimens are collected periodically throughout the summer and forwarded to the Division of Entomology for identification. Any control measures which may be necessary are carried out under the supervision of a trained entomologist.

A series of educational lectures on forest conservation was inaugurated during the year. Winter lectures were given in both rural and urban centres surrounding Riding Mountain Park in Manitoba, which is of special importance because of its valuable forest cover.

Wild Life Management

The National Parks are in the best possible position to preserve wild life, because their mandate to preserve comprehends the whole complex of earth and water, hill and dale, forest and plain, rock and snow that goes to make up a park, including the wild life. It is a fundamental fact of wild life management that no living species can be considered apart from its environment, including the other plant and animal species present there.

In so far as each park is a self-contained unit, wild life management brings few problems. The natural interplay of each species makes for a natural solution of such problems as arise, bringing about a condition known by the somewhat misleading name of "the balance of nature". The less the interference required with wild life in National Parks, the more successful, generally speaking, the management. If it is decided to interfere in the processes of nature, such a decision is made only after a most careful investigation.

Obviously, the basic requirement of wild life management is full and accurate information on animals and their environment. This is obtained from the warden service and, as often as possible, by special investigations made by competent biologists. Biologists of the Department's staff visited Riding Mountain, Prince Albert, Elk Island, Jasper, and Banff Parks during the year, and preliminary faunal reports were prepared.

Point Pelee possesses a wealth of plant and animal life of a type relatively unique in Canada; the area is so small and the number of visitors so large that it has been necessary to restrict access to certain sections to persons genuinely interested in plant and animal life, and for this purpose a representative area has been fenced.

The most striking thing about wild life in the National Parks is the fact that animals, rare in other areas, whose lease on life was thought to be poor, thrive in them. Such are the wapiti, bighorn, mountain goat, wolverine, and golden eagle.

Wild Animal Parks

Certain of the National Parks are primarily designed to preserve populations of larger mammals that have been in danger of extinction.

One of these, Buffalo National Park, is now set aside temporarily for war purposes by the Department of National Defence. In view of overcrowding and the incidence of disease, this herd of plains buffalo, and other larger mammals, were slaughtered during the preceding year. This decision was made after full analysis of the situation and on the advice of a highly qualified technical adviser.

The re-establishment of the plains buffalo in Canada has been in no way impaired by the temporary setting aside of Buffalo National Park for war purposes, as there is a large and healthy herd at Elk Island National Park, descended from a portion of the original Allard-Pablo herd in Montana. Large numbers of buffalo are also successfully established under unfenced and natural conditions in Wood Buffalo National Park. The above park was originally set aside to provide protection and feeding grounds for the wood buffalo. A staff of wardens is engaged to patrol the area, secure data on movement and condition of the animals, and effect predator control where needed. The number of buffalo in this park is now estimated at 9,000. Each year certain older buffalo bulls are slaughtered to provide meat for hospitals, missions, and needy native families within the district. There has been a marked increase in the number of muskrats in the park following construction of dams to raise the water level in certain areas. This valuable fur-bearer had been seriously depleted as a result of low water levels and over-trapping. To assist in re-establishment, trapping has been suspended in the areas affected.

The remaining wild animal park is Nemiskam in Alberta. Here a herd of prong-horned antelope is well established. This park has few visitors except those interested in mammalogy or wild life conservation.

Following is a census of wild animals in fenced enclosures within the National Parks, as of March 31, 1941:—

Animals in Fenced Areas

Animal	Banff Park Paddock	Elk Island Park	Nemiskam Park	Prince Albert Park Paddock	Riding Mountain Park Paddock	Total
Buffalo	17	1,242	.....	5	60	1,324
Antelope	.....	.....	125	.....	.....	125
Elk	3	500	.....	.....	120	623
Moose	.....	128	.....	.....	3	131
Mule Deer	.....	24	.....	.....	8	32
White-tailed Deer	.....	.....	.....	.....	7	7
Rocky Mountain Sheep	4	.....	.....	.....	.....	4
Totals	24	1,894	125	5	198	2,246

Wild Life Protection

The annual study of snowshoe rabbit, or varying hare, conducted for the Bureau of Animal Population, Oxford University, England, was continued. Close co-operation was maintained with the Northwest Territories Administration in matters concerning wild life, as well as with the Royal Canadian Mounted Police in connection with enforcement of the Migratory Birds Regulations and the issue of firearms permits to United States hunters entering Canada.

The National Parks Bureau was represented at the following conservation and scientific conferences pertaining to wild life:—

The Sixth North American Wildlife Conference, Memphis, Tennessee, February, 1941;

The Fifty-eighth Stated Meeting of the American Ornithologists' Union, Boston and Cambridge, Massachusetts, September, 1940;

The Thirty-fourth Annual Convention of the International Association of Game, Fish and Conservation Commissioners, Toronto, September, 1940;

The Seventieth Annual Meeting of the American Fisheries Society, Toronto, September, 1940;

The Twenty-third Annual Meeting of the American Society of Ichthyologists and Herpetologists, Toronto, September, 1940;

The Organization Meeting of the Canadian Conservation Association, Kingston, Ontario, April, 1940;

The Annual Meeting of the Province of Quebec Association for the Protection of Fish and Game, Incorporated, Montreal, Quebec, April, 1940.

Despite the war, no essential wild life conservation service has been discontinued, and this fact undoubtedly had a direct bearing upon the decision of the North American Wildlife Conference to hold its 1942 meeting in Canada.

Fishing and Fish Culture

During the year, fish cultural activities were carried out in eight of the National Parks, namely, Jasper, Banff, Waterton Lakes, Yoho, Kootenay, Elk Island, Prince Albert, and Riding Mountain. In July, the hatchery assistant at Waterton Park was transferred to the hatchery at Jasper. In that month, also, the Parks Bureau secured the services of a limnologist to assist in the scientific administration of fisheries management in the National Parks.

A total of 1,104,800 trout fry and fingerlings were distributed in park waters last year as follows:—

National Parks	Rainbow	Speckled	Cutthroat
Banff	344,300	110,400	3,000
Jasper	439,100	.....	.....
Waterton Lakes	64,600	.....	28,400
Yoho	25,000	.....	.....
Kootenay	60,000	.....	.....
Riding Mountain	30,000	.....	.....
Total	963,000	110,400	31,400

In Riding Mountain Park, where a planting of 30,000 rainbow fingerlings was made this year in Clear Lake in continuing the effort to stock this lake with trout, there are indications that the project is meeting with success.

At Elk Island National Park, an analysis of Astotin Lake water in late winter before the break-up of ice showed that the oxygen content of the water was far below that necessary to support fish life. The lack of success attending efforts to stock this lake may be attributed to natural causes.

In Prince Albert National Park, Waskesiu Lake was opened to fishing, after having been closed for four years. Large numbers of northern pike were caught, and fishermen were loud in their praise of the excellent fishing. The lake was closed during the period that small-mouthed black bass were being introduced. Present information suggests that the introduction of bass will be successful.

In Banff and Jasper Parks, fishing was on a par with previous years, and many limit catches were reported.

In Waterton Lakes Park, fishermen had the best summer ever experienced.

An effort was made during the year to inaugurate an adequate creel census in waters of Jasper, Banff, Waterton Lakes, Yoho, Kootenay, and Prince Albert Parks. Through such a census, information necessary for an intelligent administration of fish cultural matters is obtained. The co-operation of anglers on the whole was only fair, but it is hoped that when the purpose of this census becomes better known, fishermen will be more anxious to assist.

MIGRATORY BIRDS CONVENTION ACT

The Migratory Birds Treaty was signed in Washington, D.C., on August 16, 1916, and made effective by Act of Parliament of Canada in 1917 (Chapter 131, Revised Statutes of Canada, 1927, and Amendments), and was designed for the better protection of the birds that migrate between Canada and the United States.

In this conservation measure, the Dominion and the Provinces co-operate. Regulations are agreed upon and are made effective by both Dominion and Provincial Statutes, the Royal Canadian Mounted Police assisting with the enforcement.

The existing open season of approximately two months for the shooting of migratory waterfowl was continued throughout Canada in 1940. This relatively short season was adopted in 1936 in an effort to restore the losses incurred by migratory waterfowl. The strict daily and seasonal bag limit then imposed, the ban against use of live decoys, and prohibition of baiting waterfowl with grain remain in force.

During the winter of 1939-40, the United States Biological Survey reported serious losses to woodcock on their wintering grounds, and in conse-

quence the open season was reduced to three weeks in the woodcock area of Canada. Continuing the policy of recent years, no open season was allowed for wood ducks, and hunting of Atlantic brant was prohibited, this species not having recovered from the serious depletion of recent years caused presumably by the almost complete failure of one of its chief food products, eel-grass. Sale of migratory waterfowl continued to be prohibited.

In British Columbia the waterfowl situation during the year was in general satisfactory, and the duck population was maintained. In the Prairie Provinces as a whole, improvement was shown. This was particularly so in Alberta over a wide area from near the Saskatchewan border to the western boundary, and from south-central portions northward to well beyond agricultural settlement. Rainfall was exceptional in the aspen grove belt, and innumerable sloughs and pot-holes were filled with water and occupied by waterfowl. Saskatchewan was more irregular. Southern and southwestern parts had a heavy spring run-off and summer rains, and the showing of duck was excellent. Prairie Farm Rehabilitation Act projects, as well as those of private interests, have also provided breeding habitats for a large number of waterfowl. In the eastern portions the rainfall was insufficient. Sloughs and small lakes were still dry, the water table continued to drop, and waterfowl was scarce to absent. Southern Manitoba had a low water table with disappearing lakes, and waterfowl much as in previous years. The major lake area was low in level, but large numbers of ducks were raised in the surrounding marshes and backwaters. Breeding redheads, canvas-backs, and ruddy ducks appear definitely on the increase. However, there was one serious outbreak of botulism in the Netley Marshes, apparently caused by the low levels of Lake Winnipeg during the past 10 years.

Conditions in Ontario and Quebec were satisfactory with no definite change. In the Maritime Provinces the situation was also satisfactory except for brant. Canada geese appear to be making a slow recovery from their low of 1931.

The adverse influence of drought upon waterfowl habitat in the Prairie Provinces has been offset to some extent by water development work under the Prairie Farm Rehabilitation Act as mentioned above. Since the passing of this Act in 1935, 15,223 small projects, 300 community projects, and 54 large projects have been undertaken for the development of surface water resources. This program has entailed a steadily increasing expenditure by the Department of Agriculture, which reached the sum of $3,230,156 in 1940. It has, however, been of direct benefit to waterfowl restoration.

Under the Migratory Birds Convention Act, 59 bird sanctuaries have now been reserved in Canada, giving a total area of 1,282 square miles. Three new sanctuaries were reserved during the year: Boatswain Bay and Isle Cadieux in the Province of Quebec, and Akimiski Island in the Northwest Territories.

During the year, 26 honorary game officers were appointed under the Migratory Birds Convention Act, making a total of 798. The four District Migratory Bird Officers continued to conduct the field administration of the Migratory Birds Convention Act. In addition to their regular duties, they continued the study of the status of the lesser scaup duck, and of waterfowl food habitats in British Columbia, the inspection of bird sanctuaries and other areas, the study of waterfowl conditions in the important prairie duck nesting areas, and faunal investigations in certain national parks. The regular annual patrol of bird sanctuaries in important breeding areas on the north shore of the Gulf of St. Lawrence was continued, and an investigation of waterfowl and their conservation in the James Bay region was made. In the Maritime Provinces, conditions affecting bird life were observed, particular attention being given to the status of woodcock. Lectures were given on the value of native wild birds and their conservation, and successful co-operation was continued with the provincial governments, game conservation societies, and other organizations interested in bird conservation.

The eider-down industry continued to expand in Saguenay County on the north shore of the Gulf of St. Lawrence, with 25 leases in effect. This industry was also initiated under permit in southern Baffin Island for the benefit of the native population and the stock of eiders nesting there.

The banding of native wild birds gives invaluable information to conservationists and ornithologists. Certain problems, such as determination of summer and winter ranges, migration routes or fly-ways, concentration points, mortality rate, percentage of the take of game birds, fluctuations in abundance, sex ratio, longevity, and such related subjects cannot be completely solved without this aid. Bird-banding is conducted in North America in full co-operation between Canada's National Parks Bureau and the United States Fish and Wild Life Service of the Department of the Interior. This work is in charge of the Wild Life Division of the National Parks Bureau in Canada, and has continued to expand steadily since 1923. Practically all birds banded are marked by 200 voluntary co-operators, using official bands. These are persons of definite ornithological attainments, who hold bird-banding permits, under the Migratory Birds Convention Act. During the calendar year 1940, details of the banding of 33,655 birds were added to the official game records, and data relating to 2,754 banded birds captured, killed or found dead were added to the records available for study by officers and organizations concerned with conservation. It must be pointed out that success in this activity depends largely on voluntary co-operation in the reporting of any banded birds recovered, and this assistance is gratefully acknowledged.

During the year, 1,330 permits and licences were issued. Printed material distributed comprised 6,859 copies of Consolidation of the Migratory Birds Convention Act and Regulations; 30,344 copies of Abstracts of the Regulations; 42,458 posters, and 21,463 pamphlets. Motion picture films and slides were lent to voluntary co-operators, and 159 lectures were given by officers of the Bureau.

NATIONAL HISTORIC PARKS

During the year nine historic areas which previously had been added to the national heritage and placed under the administration of this Bureau were designated National Historic Parks.

These parks are of such special interest that a brief description of each seems desirable.

Fort Anne National Historic Park is situated in Annapolis Royal, Nova Scotia. Fort Anne to-day is the outgrowth of two French fortifications built on the same site with later additions made by the English. The museum building, restored in 1935, was originally the Officers' Quarters and was built in 1797-98 under the supervision of Edward, Duke of Kent, the father of Queen Victoria, when he was Commander-in-Chief of the British Forces in North America with headquarters at Halifax, Nova Scotia.

During the year, 5,926 persons visited the museum and, in addition, it is estimated that 5,395 visited the grounds without entering the museum, making a combined total of 11,321 persons to visit the park. Travel groups from the United States, as well as teachers and pupils from Canadian schools, were among the visitors.

A number of interesting articles were added to the collection in the park museum, including a chair which formerly belonged to Thomas Chandler Haliburton, the author of "Sam Slick".

Port Royal National Historic Park is situated at Lower Granville, Nova Scotia. On the exact site where the Port Royal Habitation stood nearly three and a half centuries ago, a replica of the group of buildings which sheltered the first European settlers in Canada has recently been erected. The original

habitation was the headquarters for about two years of Samuel de Champlain, famous explorer and chief geographer to Henry IV of France, who chose the location and drew up the plan of settlement.

The interest that is being taken in the reconstructed habitation is shown by the fact that during the year, 6,662 visitors registered at the park. Careful consideration was given to the question of furnishings for the various rooms and as a beginning, the Artisans' Dormitory has been furnished. The grounds within the courtyard and outside the buildings were levelled and seeded, the flagstone walk from the gate to the office entrance was completed and the floor of the trading-room was retamped and re-earthed.

Fortress of Louisbourg National Historic Park is situated about three miles from the town of Louisburg, Cape Breton Island, Nova Scotia. Here were enacted the early stages of the long struggle which culminated in the possession of Canada for the British Crown. Louisbourg was one of the most keenly disputed fortresses in North America. Erected more than two centuries ago by the French, who had named the settlement in honour of Louis XIV, King of France, it was captured by the British forces in 1745, but was subsequently handed back to the French. The fortress was again besieged by the English and finally captured by them in 1758. It is interesting to recall that one of the brigades of infantry engaged in the recapture of Louisbourg was commanded by General Wolfe, who was later to die heroically at Quebec. Most of the original area of the fortress has now been acquired by the Dominion Government. During the past few years, careful excavation work has been carried out and a museum established at the site. From a visit to this museum and a tour of the grounds, the visitor can reconstruct in imagination a little of the historic past of Louisbourg.

During the year repairs were carried out to the roads and fences, a new bridge was constructed over the moat at the Maurepas Gate and a new electric water pump was installed in the museum basement. Visitors registered at the museum during the year numbered 7,879, and it is estimated that at least 3,000 more entered the park without visiting the museum.

Fort Beausejour National Historic Park is situated near Aulac, New Brunswick. Built by the French, the fort was intended to be an Acadian stronghold against the undefined claims of the English to Acadia. Around the fort, Acadians had their homes and farms. It was captured by the British in 1755 and renamed Fort Cumberland. In recent years restoration work has been carried out and a new museum built at the site.

During the year all telephone poles were removed from the fort grounds and the wires placed underground; a survey was made of a small parcel of land containing the remains of the old entrenchments which it is proposed to add to the fort area; new lawns were seeded; the walks leading to the pavilion gravelled and the museum exhibits rearranged. A total of 7,488 persons signed the museum register during the year and it is estimated that an additional 5,000 visited the park without registering.

Fort Chambly National Historic Park lies about twenty miles southeast of Montreal, Quebec, on a conspicuous headland on the Richelieu River. The first fort, built by the French in 1665 as a protection from the Iroquois, was of wooden construction. After many vicissitudes, it was rebuilt of stone, this work being completed in 1711. In 1760 the fort was surrendered to the British who, with a small armed force, held it until 1775. In that year the Americans captured the fort; they evacuated it the following year, but burned everything that was combustible, leaving only the four walls standing. The fort was later repaired and garrisoned by Governor Carleton and played an important part in the War of 1812. Under the administration of the National Parks Bureau, steps have been taken to arrest the disintegration of the massive structure, and a new museum building has been erected within the walls of the fort. During the year the reclaimed area adjacent to the new retaining wall was levelled and seeded; the walls of the museum room were painted and the exhibits re-arranged; steps were taken to prevent water from entering the basement of the museum; and the roof of the caretaker's quarters was repaired. During the year, 9,345 visitors signed the museum register.

Fort Lennox National Historic Park is located on Ile-aux-Noix in the Richelieu River, about thirteen miles south of St. Johns, P.Q. The present fort, which stands on the site of one previously erected by the French, was rebuilt by the Imperial authorities in the period from 1812 to 1827, and stands majestically in memory of the defence of the Richelieu Gateway. The island, comprising an area of 150 acres, was acquired in 1921 and considerable work has been carried out on the buildings and grounds. The entire property has been taken over by the Department of National Defence for war purposes.

Fort Wellington National Historic Park is situated at the east end of the town of Prescott, Ontario, and adjacent to Highway No. 2. The fort remains as it was when finally completed in 1838, an impressive landmark. Named after the Duke of Wellington, it was erected when the British authorities decided to fortify Prescott as one of the most vulnerable points of attack in the War of 1812, and as the main base for the defence of communications between Kingston and Montreal. The fort property, comprising eight and one-half acres, was acquired in 1923.

During the year the blockhouse and officers' quarters were painted; repairs made to the caponniere; and the parking area and roadway improved. A total of 8,852 visitors registered during the year.

Fort Malden National Historic Park is situated in Amherstburg, Ontario. The fort was built in 1797-99 by the Second Battalion Royal Canadian Volunteers. It was strengthened in 1812 as the principal military station on the western frontier and dismantled and abandoned in September, 1813. Only slight evidences of the original fortifications remain, and an area of about four acres comprising a portion of these has been acquired. Of particular interest is the fireproof museum, constructed in 1939, which has been suitably furnished and already contains many interesting exhibits. During the year a new steel flagpole was erected and arrangements were made with the Department of Public Works to place the requisite fill at the rear of the shore protection wall facing the Detroit River.

Fort Prince of Wales National Historic Park is situated at the mouth of Churchill River, Churchill, Manitoba, and comprises an area of approximately fifty acres. The fort was built from plans drawn by English military engineers, to secure control of Hudson Bay for the Hudson's Bay Company and England. Construction was commenced in 1733 and completed in 1771. It was surrendered to and partially destroyed by a French naval force under La Perouse in 1782. Its ruins, which are among the most interesting military remains on this continent, have been partly restored and over forty old cannon have been unearthed and suitably mounted on the walls of the fort.

HISTORIC SITES

During the year the following historic sites were marked:—

Pioneer Fox Farming, Alberton, P.E.I.—A cut stone monument with tablet was erected adjacent to the Alberton-Elmsdale Highway, to commemorate the work of Robert T. Oulton and Charles Dalton, pioneers in breeding and raising silver black foxes in captivity, and of James Gordon and Robert Tuplin, who later assisted in developing the industry.

Samuel George William Archibald, Truro, N.S.—A bronze plate was affixed to the Court House Building, in memory of Samuel George William Archibald,

member of the Nova Scotia Assembly, 1806-41; Speaker, 1825-40; Solicitor-General, 1825-31; Attorney-General, 1831-41; Chief Justice of Prince Edward Island, 1824-28; Master of the Rolls and Judge of the Court of Vice-Admiralty, 1841-46. He was born at Truro on February 5, 1777, and died in Halifax on January 28, 1846.

Sir Adams George Archibald, Truro, N.S.—A bronze plate was affixed to the Court House Building, in memory of Sir Adams George Archibald, K.C.M.G., a Father of Confederation; Secretary of State for the Province, 1867-68; Lieutenant-Governor of Manitoba, 1870-72, and of Nova Scotia, 1873-83. He was born at Truro on May 18, 1814, and died at Truro on December 14, 1892.

William Alexander Henry, Halifax, N.S.—A bronze plate was affixed to the Law Courts Building, in memory of William Alexander Henry, a Father of Confederation, lawyer, legislator, and statesman, and Judge of the Supreme Court of Canada, 1875-88. He was born in Halifax on December 30, 1816, and died in Ottawa on May 3, 1888.

William Henry Chase, Halifax, N.S.—A bronze plate was affixed to the Public Archives Building in memory of William Henry Chase, who gave this building to his native province. He was born at Cornwallis on July 16, 1852, and died at Wolfville on November 22, 1933.

Sir Wilfrid Laurier, St. Lin, Que.—A monument in the form of a boulder with a bronze tablet was erected adjacent to the house in which Sir Wilfrid Laurier was born on November 20, 1841. He was Prime Minister of Canada, 1896-1911, and died in Ottawa on February 17, 1919.

Sir John Joseph Caldwell Abbott, St. Andrews East, Que.—A bronze plate was affixed to the Post Office Building, in memory of Sir John Joseph Caldwell Abbott, K.C.M.G., the first Canadian-born Prime Minister of Canada, 1891-92. He was born at St. Andrews on March 12, 1821, and died in Montreal on October 30, 1893. The plate was unveiled under the auspices of the Historical Society of Argenteuil County on September 7, 1940.

Battle of Stoney Creek, near Hamilton, Ont.—A tablet was affixed to the Battle of Stoney Creek monument, in honour of those who fell in the engagement which took place on June 6, 1813. The tablet was unveiled on October 11, 1940, under the auspices of the Women's Wentworth Historical Society.

Blockhouse, Merrickville, Ont.—A bronze plate was attached to the old stone blockhouse, marking it as a fine example of the best type of the blockhouses erected for the defence of the Rideau Canal. It was built about 1832. The tablet was unveiled with suitable ceremonies on June 12, 1940.

Murney Tower, Kingston, Ont.—A bronze plate was affixed to the Murney Tower in Macdonald Park, which was built in 1846, by the Imperial Government for the defence of Kingston harbour and the lake terminal of the Rideau Canal.

Douglas Brymner, Ottawa, Ont.—A tablet was erected in the main entrance of the Public Archives Building, to commemorate the public services of Douglas Brymner, LL.D., F.R.S.C., first Dominion Archivist, whose historical acumen and unflagging industry over a period of thirty years contributed in such large measure to the establishment of the Public Archives of Canada.

Battle of Queenston Heights, Queenston, Ont.—A tablet was affixed to the General Brock monument in honour of those who fell with General Brock in the engagement which took place on October 13, 1812. The tablet was unveiled on October 12, 1940, under the auspices of the Niagara Historical Society.

Rocky Mountain House, Alta.—An area comprising the site of this North West Company Post was acquired and a bronze plate affixed to the remains of one of the original chimneys, which are being preserved as rare examples of the primitive chimneys built by the fur-traders in their posts long before that region had a settled population.

Sir Richard McBride, New Westminster, B.C.—A bronze plate was erected in the Sir Richard McBride Public School, in memory of Sir Richard McBride, K.C.M.G., Premier of British Columbia, 1903-15, and Agent-General of British Columbia, 1915-17. He was born in New Westminster, December 15, 1870, and died in London, England, August 8, 1917.

DOMINION FOREST SERVICE

From the beginning of the present war a very important feature of Canadian policy has been the provision of United States exchange for the purchases of war supplies that could not be had in Canada. The part played by products of the forest and forest industries in our external trade in 1940 has assumed exceptional significance. These industries occupy a special position in the Canadian economy because their extensive exports are not offset by large imports. Trade in all commodities, except "wood, wood products, and paper", together with net exports of non-monetary gold, yielded a credit balance to Canada of only 4 million dollars; but trade in wood and paper provided further credits of 310 million dollars. Exports of these commodities were valued at 348 million dollars and imports at only 38 million dollars. Exports of newsprint paper alone were valued at 151 million dollars, and exports of lumber at nearly 70 million dollars.

Despite serious losses of key personnel to the war services, the Dominion Forest Service, during the fiscal year, was able to assist in Canada's war activities to an increasing degree. At the request of the Director of Internment Operations, sites were provided for internment camps at three forest experiment stations and the Dominion Forest Service undertook to provide useful forestry work for the internees. A grand total of 46,291 man-days' work was carried out by the internees at these stations.

The main effort of the Forest Products Laboratories at Ottawa and Vancouver was directed to war work. Preparation of specifications calling for the use of Canadian woods in place of imported woods, design of munitions containers, and special testing of many kinds were projects undertaken for the De artments of National Defence and Munitions and Supply. The Laboratories were consulted extensively by war industries in the solution of special problems in the use of wood or wood products.

In connection with the organization of the Canadian Forestry Corps, lists of trained forest officers were provided to the Officer Commanding. Following the establishment of the office of the Timber Controller for Canada in the Department of Munitions and Supply, in June, 1940, the Dominion Forest Service co-operated closely with that officer. Two members of the staff of the Service were loaned to the Timber Controller, and a map showing the location of sawmills in Canada, numbering over 6,000, was prepared. In this work every assistance was given by the forest authorities of all provinces.

One of the outstanding advances in the fiscal year was the completion of an agreement with the Canadian Pulp and Paper Association and McGill University for the foundation of the Pulp and Paper Research Institute of Canada at Montreal. This agreement provided for unified direction of pulp and paper research on an expanded scale. The staff of the Pulp and Paper Division of the Forest Products Laboratories located at Montreal has, under the terms of this Agreement, been loaned to the Institute. Since its establishment, the Pulp and Paper Institute has undertaken important investigations having to do with the war effort.

Forest resources play an important part in the effective prosecution of the war and must be looked to to play an increasingly important part in the difficult reconstruction period which will follow the war.

FOREST ECONOMICS

The Canadian forests, and the industries that they provide with raw materials, gave valuable assistance to the war effort of Canada and the Empire during 1940.

The United Kingdom is the largest importer of lumber in the world. Ordinarily she obtained more than three-quarters of her total softwood requirements from European countries, among which the chief lumber exporters were the Scandinavian and Baltic countries, the Soviet Union, and Poland. When ports of these countries were closed by enemy action, Canada remained as almost the sole source of supply on which the Mother Country could rely. The volume of lumber shipped to the United Kingdom totalled 1,616 million board feet, exceeding the previous record shipments of 1939 by 392 million board feet. Through special arrangements with the railroads, it was possible to transport a substantial proportion of the total shipments by rail from British Columbia to eastern ports, in order to conserve ocean cargo space.

Approximately 400 million board feet of domestic lumber were used in Canada for war projects, including new factories, offices, and training camps for the armed services. Notable among the 5,000 wooden buildings erected were 335 timber-framed aircraft hangars and drill halls. These buildings had free spans of 112 feet, and their zinc-chloride treated trusses and columns were built up through use of modern timber connectors. In addition to lumber used in construction, very large quantities were needed for containers such as boxes and crates.

The demand from aircraft builders for Sitka spruce of the highest quality equalled that during the last war, although the majority of military aircraft are now of metal construction. Selected yellow birch logs provided large quantities of high-quality veneers for the manufacture of wing coverings. The newly established pit-prop industry forwarded many shiploads of mining timbers to the coal mines of England and Wales.

To meet the abnormal conditions created by wartime demands, and to ensure that available stocks should be used to the best advantage, the office of Timber Controller for Canada was created in the Department of Munitions and Supply. Through co-operation between the Controller and the lumber trade excellent results were obtained, and price movements were held within a narrow range.

The estimated volume of merchantable timber in Canada's forests is shown in the following table:—

Merchantable Timber

Millions of Cubic Feet

—	Accessible	Inaccessible	Total
Conifers	146,300	89,723	236,023
Broad-leaved	65,356	11,761	77,117
Total	211,656	101,484	313,140

Average annual depletion of merchantable timber during the ten-year period 1930-39 is estimated at 3,623 million cubic feet, which is equivalent to 1·7 per cent of the volume of accessible timber.

Average Annual Depletion, 1930-39

	Millions of Cubic Feet
Volume used	2,519
Merchantable timber burned	404
Destroyed by insects, fungi, etc	700
	3,623

Approximately 70 per cent of the total depletion was used, and 30 per cent wasted.

It is not yet possible to estimate depletion in 1940; but, considering the forests as a whole, it seems unlikely that war requirements will increase total depletion to any dangerous degree. On the other hand, the abnormal demands for such special products as Sitka spruce and high quality yellow birch logs may make heavy inroads into the reserves of these species.

A depletion rate of 1·7 per cent is not high, particularly when there are large inaccessible areas in reserve. But a large proportion of that depletion is concentrated on the most accessible and most valuable parts of the forest. There is, then, a condition in which much of the forest is not being used while severe over-cutting is taking place in certain localities. To a considerable degree, this state of affairs is unavoidable under conditions as they exist in Canada to-day, but it must be borne in mind if the significance of depletion figures is to be correctly understood.

The relative importance of the principal branches of forest industry in 1939 is indicated in the following table:—

FOREST INDUSTRIES

Summary of Principal Statistics, 1939

—	Number of Employees	Salaries and Wages	Net Value of Products
		$	$
Woods operations[1]	98,000	79,000,000	157,747,398
Lumber industry	32,399	26,396,308	44,852,358
Pulp and paper industry	31,016	44,737,379	103,123,660
Wood-using industries	31,305	28,363,615	43,561,693
Paper-using industries[2]	12,341	14,285,258	27,792,626
Totals	205,061	192,782,560	377,077,735

(1) The figure given for number of men employed in the woods is an equivalent calculated on a man-year basis.
(2) Exclusive of the printing trades.

The net value of all products of the forest industries in 1939 exceeded that of the previous year by 10·3 per cent.

AERIAL FOREST SURVEYS

Further refinements were made in the design of the duoscope, a patented instrument developed by the Forest Service for the transfer of information from aerial photograph to map. One instrument was sent to England in order that its value in plotting aerial reconnaissance data might be tested by military authorities under service conditions. The duoscope has been adopted for mapping purposes by 16 organizations, mostly in the forest industries.

Improvements in the illumination system of the photoelectric planimeter increased the efficiency and reduced the cost of construction of the instrument. This planimeter has been developed by the Forest Service to facilitate the measurement of mapped areas.

A field test of the accuracy of detailed estimates of pulpwood volumes prepared from aerial photographs was completed in co-operation with a commercial company in New Brunswick. The stands surveyed contained a considerable admixture of hardwoods, and the photographs used were taken in winter. The company reports that on an area of 1,203 acres of mixed forest the quantity of coniferous pulpwood actually cut was 3·2 per cent less than the estimated volume. This test indicates that estimates of gross volume of coniferous pulpwood can be made from winter photographs with accuracy sufficient to meet operating requirements. A similar test in softwood forests is in progress on an area of five square miles near Baie Comeau, P.Q.

Detailed forest maps and timber estimates were completed for the Petawawa Forest Experiment Station, the area dealt with during the current year being 38 square miles.

Forest areas of 27 square miles in the vicinity of Lake Minnewanka in Banff National Park were mapped, and timber estimates were prepared for 2·3 square miles which will be submerged when the level of this lake is raised. Timber was also estimated on a small flooded area in the Northwest Territories.

Further work was done in estimating fuelwood available to Indians on the reserve at Oka, P.Q. Estimates for timber disposal purposes were prepared for two Indian reserves in Saskatchewan and one in Ontario.

Forest inventory maps covering 1,325 square miles in Nova Scotia, 420 square miles in Prince Edward Island, and 386 square miles in Saskatchewan were completed. This information is turned over to the provincial authorities as it becomes available.

SILVICULTURAL RESEARCH

The Dominion Forest Service operates 5 forest experiment stations, each representative of conditions in a major forest region. These stations are utilized for the conduct of silvicultural research and investigations respecting the rates and conditions of growth of the main tree species found in these regions. Information obtained as a result of long-term experiments is assembled and results showing promise are applied on larger areas for demonstration purposes. Special attention is paid to the cultural treatment of second growth stands which have come in as a result of cutting or fire, or both. These young forests are important because from them Canada's forest industries must draw their next crop. Under scientific management a better crop of higher grade material can be obtained in a shorter time than would be possible if these stands were left to develop under natural conditions.

Naturally the timber on the forest experiment station areas does not include all types and age classes occurring in their respective forest regions. Work at the stations must, therefore, be supplemented by additional studies conducted on outside areas in co-operation with the provincial authorities and the forest industries.

In general, the forest experiment stations are essentially field laboratories to devise methods of treatment which can be applied by industry to its own holdings as economic and other conditions make that action feasible and desirable.

Research projects at the forest experiment stations have now been classified in accordance with the new Classification for Forest Research Projects developed last year.

Forest Botany

Standardized forms and plans have been prepared for collection of phenological data on a uniform basis by the several interested agencies, but owing to abnormal conditions these are not yet in use. Weekly records were taken according to the Forest Service standard at the Acadia, Petawawa, Riding Mountain and Kananaskis stations.

In connection with war requirements for yellow birch veneer stock, an estimate of yellow birch supplies in Canada was made. This estimate was based on rate-of-growth surveys of 1929-30 and on reports obtained from timberland holders in the Provinces of New Brunswick and Quebec. The total supply is estimated to be 27 billion feet board measure, material 10 inches in diameter at breast height. This volume, however, makes no provision for cull. Subsequent reports suggest that not more than 10 per cent of the stand is suitable for veneer purposes.

In co-operation with the Quebec Forest Service and holders of certain pulpwood lands, a study of the practical application of the site-type classification system in estimating timber for working plan purposes was started. Upon examination a definite relationship between site-type, height growth, and topography was found to exist. On the basis of a five-type classification an extensive working-plan survey combining aerial photography, line-plots, and transect sample plots was undertaken.

A comprehensive report on budget determination for sawmill operations in northern Saskatchewan was prepared. This report, based on a number of surveys of cut-over lands, offers a plan of cutting for sustained yield. It offers, alternatively, a two-cut system of management, designed to prolong operations beyond the closing date likely from methods now in common practice.

A brief tabular statement was prepared from rate-of-growth and various regeneration surveys, which shows how the proportion of spruce tends to increase over that of balsam fir as the stand develops from seedlings to standards. Although there is considerable variation from province to province, and from cover-type to cover-type, the trend for the proportion of spruce to increase as the stand matures is constant. The most pronounced instance is that of the softwood cover-type in Nova Scotia, where spruce represents only 9 per cent in the seedling class, and 75 per cent in the standards. The least variation is found in the mixed-wood type in Algonquin Park where spruce seedlings constitute 25 per cent of the total seedlings and 67 per cent of the standards. These data suggest that there is no cause to fear that balsam fir will replace spruce in the future stands.

A series of thirty volume tables has been issued as a supplement to those issued in the volume table booklet of 1936. These include local tables for eastern white cedar, yellow birch, hard maple, beech, and poplar.

Genetics

Genetic studies are carried on at the Petawawa Station in co-operation with the Associate Committee on Forestry of the National Research Council. Considerable progress has been made in vegetative propagation of stem cuttings, notably with white pine and Norway spruce. Development of a means of reproducing white pine vegetatively envisages the possibility of producing blister rust-resistant and weevil-resistant white pine stock. An important discovery is that Alfred peat humus and sand is a satisfactory medium for the rooting of white pine cuttings. Late July or August seems to be the most favourable season for planting pine cuttings.

Technique in the methods of propagating poplar cuttings has been improved. Propagation of basswood cuttings has not yet been successful. Studies in propagation by root cuttings and by grafting are now under way. Many strains and species, native and exotic, are being tested at the several stations. A strain

of Scotch pine from Finland gives indication of better growth and form than the strains usually cultivated in Canada.

Certain strains of white pine from regions of moist climate show better results if spring sown—an important factor in reducing loss of seed from rodents. A strain of western white pine that gives promise of rust-resistance was sown. Selected Douglas fir seed from Shuswap Lake gives promise of successful results.

Of the many poplars under investigation, selection is now being made of the hardy varieties. The aspen-silver poplar hybrids seem to be superior to cottonwood-balsam poplars. Similar investigations are in progress at the Acadia and Kananaskis stations. Tree-testing gardens have been established at Petawawa and Acadia, to study the silvical characteristics of selected strains and species.

Ecology

Studies of factors influencing natural reproduction on open lands, seed dissemination, and influence of various methods of treating the seed-bed to obtain natural reproduction were carried on at all the stations.

Silviculture

The major activities at all stations are those connected with seeding and planting, and more particularly with intermediate and final cutting methods. Notable success has been had at Petawawa in germinating basswood seed. Basswood seems to require three years to germinate. Special care is required in preparation of the soil. The seed must be protected against rodents. The length of time for stratification of ash seed varies with species. Good progress has been made in methods of preparing nursery soils adapted to various species. Extensive use is being made of sawdust added to the soil, and of soy beans and vetch as soiling crops. Progress has also been made in methods of raising seedlings. Broadcast seeding seems to be more successful than drill seeding.

Developments have been made in transplanting and planting technique. Studies in thinnings of all species are under way at all stations. These include thinning and pruning of red pine plantations to spacings of 10, 12 and 14 feet. Effect on crown and form development and stem growth is under observation. Cost data have been taken. Studies at Acadia are in the spruce-balsam-white birch cover-types; at Kananaskis in spruce and lodge-pole pine types. At the Acadia, Valcartier, Petawawa, and Kananaskis stations extensive improvement and harvest cuttings were conducted in the form of timber sales and permits, and to provide fuelwood for military training camps and internment camps. Returns from these operations are as follows:—

—	Saw timber	Fuelwood (Cords)	Mine timber (Lineal feet)	Returns $
Acadia—				
26 permits		853		513 80
Internment		1,325		795 00
Total		2,178		1,308 80
Valcartier—				
15 permits	2,250 cu. ft.	376		426 00
Camp	38,000 "	2,271		1,114 00
Total	40,250 "	2,647		1,540 00
Petawawa—				
54 permits	929,908 cu. ft.			19,891 99
Internment		1,200		900 00
Total	929,908 "	1,200		20,791 99
Kananaskis—				
42 permits	906,000 bd. ft.	1,005	238,000	6,364 41
Internment		2,741		1,404 75
Total	906,000 "	3,746	238,000	7,769 16

Mensuration

A new series of merchantable volume tables for pines and hardwood species has been prepared and published in Research Note form. Developments have been made at Petawawa in scaling technique to provide for cull factors.

Protection

Meteorological and fire hazard records were kept throughout the season at the Acadia, Petawawa and Kananaskis stations.

The Forest Pathological Service, Department of Agriculture, conducted ten projects at the Petawawa station, concerned with diseases in pines and poplar. The Entomological Service, Department of Agriculture, studied problems of white pine weevil, larch sawfly, and tent caterpillar at this station.

The following Research Notes were issued in mimeographed form: No. 57, Thinning and Pruning Experiments, Red Pine Plantation, by J. W. B. Sisam; No. 58, General Outline for Reproduction Studies, by R. H. Candy; No. 59, Some Simple Management Methods Applied to Farmers' Woodlots, by W. M. Robertson; No. 60, Some Observations on a Visit to New England and New York, by C. C. Heimburger; No. 61, Classification for Forest Research Projects; No. 62, Experimental Girdling in Mixedwood Stands, New Brunswick, by W. B. M. Clarke; No. 63, Sprout Control in Wire Birch Stands, New Brunswick, by W. B. M. Clarke; No. 64, Silvicultural Research Operations, 1939-40; No. 65, Site-types and Rate of Growth, Lake Edward, P.Q., by R. G. Ray.

FOREST PROTECTION

Research work in forest fire protection is carried on by the Dominion Forest Service at its forest experiment stations, and at other points in co-operation with the National Research Council, with various Provincial Governments, and with forest industries. This work includes the improvement and extension of methods for the daily measurement and forecasting of forest fire-hazard now widely used by various forest-protective agencies as a guide to administrative action, also studies directed to the improvement of methods, equipment, and technique for detecting and suppressing forest fires, and increasing the general effectiveness of fire-protective effort.

As in previous years, the Forest Service undertook responsibility for the compilation of annual statistics of forest fire losses in Canada, from information supplied by provincial forest services and other forest-protective organizations.

Considering Canada as a whole, the fire season of 1940 was about normal. From the Great Lakes eastward the fire situation was better than the average for the past ten years, but Western Canada experienced worse than normal conditions. The total of fires reported was 6,284 compared with an average of 6,087 for the period 1931-40. Twenty-five per cent of these fires were started by lightning, as against an average of 16 per cent attributed to this cause during the past 10 years. The total loss and damage, including cost of fire-fighting, was $3,776,652 as compared with an average of $4,498,463 for the ten-year period 1931-40. Detailed statistics of forest-fire losses and causes for Canada as a whole, in each of the 10 years 1931-40, will be found in Tables 1 and 2 (pp. 104 and 105). Table 3 (p. 106) gives the corresponding figures by regions together with the number of fires, the proportion caused by lightning, the areas burned, and the fire losses.

A short description of the fire season, by provinces, follows:—

British Columbia.—The months of June, August, and September were generally dry but the other months of the fire season were wetter than normal. The number of fires started by lightning was unusually large. This cause

of Scotch pine from Finland gives indication of better growth and form than the strains usually cultivated in Canada.

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A short description of the fire season, by provinces, follows:—

British Columbia.—The months of June, August, and September were generally dry but the other months of the fire season were wetter than normal. The number of fires started by lightning was unusually large. This cause

accounted for 54 per cent of the fires compared with the ten-year average for the province of 29 per cent. The total number of fires was 39 per cent above the normal for the ten-year period 1931-40 and the cost plus damage was 3 per cent above normal.

Alberta.—This province again experienced much dry weather over certain forest areas. Although the total number of fires was 12 per cent below normal, many of these fires were difficult to control and the total cost, inclusive of damage, was 13 per cent above the average for the ten-year period 1931-40.

Saskatchewan.—Owing to scanty winter precipitation and sub-normal rainfall throughout the season, the fire season of 1940 was the worst experienced since the disastrous fires of 1937. The total number of fires was 72 per cent above the average for the ten-year period 1931-40 and the cost plus damage was 21 per cent above normal.

Manitoba.—The fire-hazard conditions were the worst experienced in many years. The total number of fires was 666, the greatest number on record, exceeding the previous record of 660 in 1929. The area burned, however, was less than in the bad years of 1929 and 1930. Low winter precipitation in the inter-lake region resulted in a large number of winter camp-fires smouldering in the ground and spreading rapidly with the advent of dry spring weather. In many cases these ground fires could not be reached before they had done much damage, owing to the inability of aeroplanes to land on the melting ice. In the region around Lake Winnipegosis fires burned from early spring until autumn, and in August an extremely bad situation, continuing into October, developed east of Lake Winnipeg. The total number of fires during the season was 63 per cent above the average for the ten-year period 1931-40 and the cost plus damage was 104 per cent above normal.

Ontario.—The fire season in general was a moderate one. The spring hazard was high throughout and in the latter part of the summer a very high hazard developed in the western part of the province. In the east the hazard was mostly normal to low after rains in early June ended the spring hazard. The total number of fires was 35 per cent below the normal for the ten-year period 1931-40 and the cost plus damage was 69 per cent below normal.

Quebec.—The fire season for 1940 was on the whole favourable, rainfall, with a few exceptions, being well distributed. The total number of fires was 21 per cent below the average for the ten-year period 1931-40 and the cost, including damage, was 74 per cent below normal.

New Brunswick.—The forest fire season was again favourable, precipitation being well distributed, with no extensive dry periods. Spring brush-burning by settlers was controlled when the fire-hazard increased, and as the public is becoming educated to the necessity of strict enforcement of the regulations in this connection, desired results are being attained. The chain of forest weather stations was again in operation and the fire-hazard index was computed daily for all regions and used in fire-protection planning. The total number of fires was 15 per cent below the normal for the ten-year period 1931-40 and cost plus damage was 94 per cent below normal.

Nova Scotia.—This province experienced a better than average year. The total number of fires was 30 per cent below the average for the ten-year period 1931-40 and cost plus damage was 54 per cent below normal.

Dominion-protected Lands.—These comprise National Parks, Indian Reserves, and Dominion Forest Experiment Stations. Fire losses were much above normal in some of the National Parks in the western provinces owing to the exceedingly high hazard conditions which prevailed in those regions. With these exceptions Dominion-protected lands experienced a favourable fire season. Fires which occurred in these areas are not included in the statistics of the provinces in which such lands are located, but are shown separately in Table 3.

Forest-fire Research

At the Petawawa Forest Experiment Station work was continued with the object of improving the system of measuring and forecasting forest fire-hazard, developed at this station. At the Fredericton Fire Hazard Station and the Acadia Forest Experiment Station studies were continued in co-operation with the province and with forest industries with a view to adapting this system to meet most adequately the needs of forest protection in New Brunswick. At Kananaskis Forest Experiment Station basic research work on fire-hazard conditions peculiar to the east slope of the Rocky Mountains was continued. Weather stations were established at suitable points in Banff, Jasper, and Waterton Lakes National Parks for the purpose of computing the daily index of fire-hazard in these areas. The operation of the system of fire-hazard measurement in Riding Mountain and Prince Albert National Parks was also supervised from the Kananaskis Station.

Numerous tests and experiments were made with new fire-protection equipment. A variable-stream nozzle for hand-spray pumps was designed, as well as an improved device for repairing linen fire hose.

TABLE 1

Statement of Forest Fires in Canada by Years for the 10-Year Period 1931-40, with Average for the Period

Item	Year										Total	Average
	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940		
Fires under 10 acres	.....	.....	.....	.....	.....	4,031	3,886	4,476	3,990	4,477	.....	.....
Fires 10 acres and over	.....	.....	.....	.....	.....	1,915	2,063	2,171	1,623	1,807	.....	.....
Total number of fires	6,965	6,298	6,298	5,911	4,955	5,946	5,949	6,647	5,613	6,284	60,866	6,087
Total area burned....acres	2,093,922	2,463,923	1,008,558	1,475,117	856,183	3,026,646	4,271,431	3,125,768	1,115,179	2,691,135	22,127,862	2,212,786
Merchantable timber—												
Area burned....acres	394,824	708,085	204,405	321,414	172,592	919,764	662,792	722,199	199,288	462,454	4,767,817	476,782
Timber burned....M ft. b.m.	583,551	569,126	255,383	899,545	98,971	2,077,584	408,942	2,160,192	196,803	478,879	7,683,976	768,398
Timber burned....cords	1,241,647	2,705,374	650,318	836,554	785,552	3,524,493	4,354,820	2,557,780	911,051	1,726,348	19,293,937	1,929,394
Estimated stumpage value.. $	1,715,113	5,063,577	1,199,305	1,754,882	1,254,981	4,646,726	2,082,018	2,777,882	599,315	1,355,322	22,449,121	2,244,912
Young growth—												
Area burned....acres	590,234	586,141	220,620	242,101	191,940	739,701	2,035,830	719,461	326,358	788,425	6,440,811	644,081
Estimated value.... $	1,215,682	1,209,063	454,648	573,455	326,423	1,284,102	1,161,861	1,286,512	448,924	906,228	8,866,898	886,690
Cut-over land—												
Area burned....acres	535,418	772,625	331,614	562,446	258,964	303,348	188,385	548,792	266,542	197,295	3,965,429	396,543
Estimated value.... $	219,776	615,605	187,303	246,031	262,725	66,253	155,276	328,737	*188,163	196,157	2,466,026	246,603
Non-forested area burned...acres	573,442	397,069	251,918	349,156	232,687	1,063,833	1,384,424	1,135,316	322,991	1,242,961	6,953,797	695,380
Other property burned, value $	363,516	264,769	162,075	149,923	355,541	84,560	151,809	827,804	283,798	376,488	3,020,283	302,028
Total damage.... $	3,514,087	7,153,014	2,003,331	2,724,291	2,199,670	6,081,641	3,550,964	5,220,935	*1,520,200	2,834,195	36,802,328	3,680,233
Actual cost of fire fighting.... $	931,504	683,650	509,939	827,451	526,743	1,206,863	878,563	1,045,637	629,497	942,457	8,182,304	818,230
Total damage and costs.. $	4,445,591	7,836,664	2,513,270	3,551,742	2,726,413	7,288,504	4,429,527	6,266,572	*2,149,697	3,776,652	44,984,632	4,498,463

* This is less by $579,624 than shown in the 1939 report owing to an error of over-valuation in Alberta returns in that year.

TABLE 2

Statement of Forest Fires in Canada by Causes for the 10-year Period 1931-40

Cause	Year																		Total No. Fires	Average 1931-40	
	1931		1932		1933		1934		1935		1936		1937		1938		1939		1940				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		No.	%
Camp-fires	1,481	21	1,329	21	1,202	19	1,111	19	875	18	1,185	20	1,235	21	1,390	21	1,108	20	1,067	17	11,983	1,198	20
Smokers	998	14	809	13	893	14	971	17	985	20	947	16	860	14	980	15	1,004	18	1,115	18	9,562	956	16
Settlers	1,097	16	1,385	22	1,265	20	946	16	1,143	23	567	9	973	16	1,154	17	845	15	808	13	10,183	1,018	17
Railways	625	9	354	6	312	5	255	4	192	4	176	3	232	4	176	3	185	3	210	3	2,717	272	4
Lightning	880	13	651	10	940	15	957	16	331	7	1,529	26	832	14	1,046	16	796	14	1,569	25	9,531	953	16
Industrial operations	133	2	91	1	94	1	198	3	123	2	132	2	190	3	176	3	112	2	132	2	1,381	138	2
Incendiary	674	10	746	12	511	8	349	6	400	8	608	10	383	7	558	8	465	8	306	5	5,000	500	8
Public works	97	1	47	1	56	1	104	2	35	1	42	1	88	1	57	1	75	1	30	1	631	63	1
Miscellaneous known	368	5	243	4	300	5	365	6	324	6	288	5	528	9	488	7	590	11	525	8	4,019	402	6
Unknown	612	9	643	10	725	12	655	11	547	11	472	8	628	11	622	9	433	8	522	8	5,859	586	10
Totals	6,965	100	6,298	100	6,298	100	5,911	100	4,955	100	5,946	100	5,949	100	6,647	100	5,613	100	6,284	100	60,866	6,086	100

TABLE 3

Statistics of Forest Fires by Regions, 1940

Averages given are those for the ten-year period 1931-40

Item	British Columbia		Alberta		Saskatchewan		Manitoba		Ontario	
	1940	Average	1940	Average	1940	Average	1940	Average	1940	Average
Fires—										
Total number	2,338	1,676	313	358	427	248	666	404	1,014	1,563
Caused by lightning ... %	54	29	3	4	1	5	5	9	21	21
Areas burned, acres—										
Merchantable	76,977	66,877	143,037	123,186	73,573	47,479	82,516	32,635	42,205	146,948
Young growth	53,582	79,572	207,662	154,866	319,931	235,324	69,138	33,090	36,380	76,752
Cut-over	61,690	213,538	14,948	17,496	41,194	15,250	14,815	4,506	37,928	21,471
Non-forested	297,754	66,540	108,597	164,592	348,564	158,115	411,627	144,191	5,101	94,034
Total	490,003	426,527	474,244	460,140	783,262	456,168	578,096	214,422	121,614	339,205
Damage ... $	647,352	872,982	968,979	835,299	238,317	195,731	311,104	124,823	279,267	1,004,194
Cost of fire-fighting ... $	441,772	190,669	65,991	74,686	87,481	62,121	71,461	32,879	119,891	268,561
Total damage and costs ... $	1,089,124	1,063,651	1,034,970	909,985	325,798	257,852	382,565	157,702	399,158	1,272,755

Item	Quebec		New Brunswick		Nova Scotia		Dominion Lands					
							National Parks		Indian Lands		For. Expt. Stations	
	1940	Average	1940	Average	1940	Average	1940	Average	1940	Average	1940	Average*
Fires—												
Total number	861	1,087	220	260	251	356	104	79	83	51	7	7
Caused by lightning ... %	2	5	16	12	0	0	15	9	15	14	0	13
Areas burned, acres—												
Merchantable	6,623	41,506	182	7,522	808	1,477	34,169	6,245	2,364	2,503	0	449
Young growth	4,963	36,522	390	6,634	1,980	4,612	92,342	14,283	1,980	1,641	77	873
Cut-over	17,465	110,564	433	10,241	564	1,269	7,494	1,504	756	673	8	36
Non-forested	10,897	20,482	1,002	24,457	2,265	9,181	52,357	11,179	4,794	1,981	3	719
Total	39,948	209,074	2,007	48,854	5,617	16,539	186,362	33,211	9,894	6,798	88	2,077
Damage ... $	98,545	524,037	2,874	80,623	4,346	21,774	277,417	61,824	5,890	11,359	104	6,165
Cost of fire-fighting ... $	70,856	118,844	3,624	26,874	16,023	22,376	57,490	16,461	7,689	4,296	179	594
Total damage and costs ... $	169,401	642,881	6,498	107,497	20,369	44,150	334,907	78,285	13,579	15,655	283	6,759

* Exclusive of 1933.

White Pine Blister Rust

Although the need for effective, co-operative action toward controlling the progress of this disease in Canada's eastern white pine forests continues, imperative war requirements through the year 1940-41 prevented allocation of funds and the carrying on of active field work.

The extensive reconnaissance surveys of recent years in the white pineries of the lower Ottawa Valley have made it clear that the first logical step toward protecting the pine lies in destroying the domestic black currant bushes throughout that region. In the State of Michigan, where conditions are almost similar, this was the first step taken, and at once an appreciable decrease in the rate of spread of the blister rust was observed.

In May, 1940, a co-operative research study was begun at Petawawa and points farther west to obtain data on the present degree of infection and course of development of the rust on Crown lands. Members of the Division of Botany and Plant Pathology of the Department of Agriculture and of the Forest Service co-operated in this initial field work, which consisted of laying out and analysing several series of line plots. To reach useful conclusions further work will be required.

By reason of the relative dryness of the white pine belt in eastern Ontario and western Quebec, the natural forest conditions are favourable for control of the blister rust. Moreover the great value of the white pine, whether for commercial or scenic purposes, makes it highly desirable that such a protective campaign be undertaken.

FOREST PRODUCTS LABORATORIES

The Forest Products Laboratories devote attention to scientific and technical problems pertaining to the manufacture, use, and marketing of the products of the forests. Of particular importance is improvement in mechanical and chemical processes and the curtailment of waste in the forest, in manufacturing plants, and in the use of forest products. Close collaboration is maintained with industry and with organizations working in similar or related fields in other countries.

During the past year a very large portion of the time of the laboratories was devoted to the preparation of specifications for wooden construction of various types associated with the war effort, to testing of special constructions and assemblies, and to committee and consulting work with various war departments.

The main laboratories are located in Ottawa. A branch laboratory is operated in Vancouver in association with the University of British Columbia. Pulp and paper problems of the laboratories are dealt with through an arrangement with the Canadian Pulp and Paper Association and McGill University for the joint operation of the Pulp and Paper Research Institute in Montreal.

Following are brief references to some problems which have received attention during the year in the three laboratories.

Main Laboratories, Ottawa

DIVISION OF WOOD PRESERVATION

Considerable work was carried out in treating timber with fire-retardants for military services. Work was continued on the testing of fire-retardant paints for military purposes, several being found which gave satisfactory performance. A process was developed for increasing the fire-resistance of plywood without the use of elaborate or expensive equipment.

Work on zinc chloride, chromated zinc chloride, zinc silico-fluoride, and lead silico-fluoride to find out their toxicity and resistance to leaching, was

completed. Chromated zinc chloride showed appreciably greater resistance to leaching than zinc chloride. The fluosilicates were most readily leached.

Considerable new data were assembled on the service life of timbers in commercial structures under observation in different parts of Canada.

Timbers cut in the spring, summer, and autumn were kept under observation to determine their relative durability under certain soil conditions.

Observation of poles treated in 1938-39 indicates that air-seasoning followed by a treatment with a low-residue creosote oil will ensure adequate sapwood penetration and a minimum of "bleeding" after treatment.

Member companies of the Canadian Electrical Association supplied material and labour for the erection of 176 treated stubs for service tests in the laboratory test plot to determine the efficiencies of different treatments of poles.

Samples of tar produced in Canada from western coal by a medium temperature process were examined and found to have valuable properties as wood preservatives.

DIVISION OF TIMBER MECHANICS

A large volume of work was carried out on the assembly of plywood with different types of adhesives to determine the effect of subjecting wood to high temperatures in the press and of different temperatures, pressures, and periods of pressure on the quality of the bond. Particular attention was paid to phenol and urea resin adhesives now used so widely for aircraft and other exacting requirements.

The investigation of different types of frame-wall construction, undertaken originally in connection with Dominion Housing, was extended to meet requirements for military construction. A design of roof panel made from weatherproof plywood was submitted for test for use in building munition plants.

Joints with ring-connectors have been used extensively in military and other structures. The work of the laboratories in securing data on this type of joint has proved invaluable in connection with establishing permissible stresses for Canadian timbers jointed in this manner. During the year analyses were completed of the tests made upon joints of the more important Canadian structural timbers having the members at angles of 30 degrees, 45 degrees, 60 degrees, and 90 degrees.

Having in view heavy demands on the supply of Sitka spruce for aeroplane timber, work was carried out on eastern spruce to determine whether appreciable quantities of such material could meet exacting specifications for aircraft spruce.

In order also to assist in meeting the demand for high-grade spruce an investigation was carried out on the building up of laminated aeroplane spars using combinations of hardwood and softwood laminae. The investigation included a study of the effect of scarfed joints on the strength of the assembly.

Special attention was paid to the use of wood and plywood in aircraft. Problems have been dealt with pertaining to various methods of assembling veneers; basic strength factors of plywood for various purposes; the efficiency of different adhesives; technique in the manufacture of aeroplane propellers; the testing of plywood and of aircraft glues to Air Force specifications; and co-operation with the Wooden Aircraft Committee of the National Research Council.

Experiments were carried out on the development from Canadian materials of life-floats to replace those constructed of imported material.

A very large amount of work was performed in connection with war services and manufacturers on the design, testing, and specification of materials for containers for the shipment of war materials. These containers were of wood, corrugated board, fibreboard, and other materials. Of particular value in this work was the large 16-foot hazard machine in the laboratories.

Testing of samples submitted by the Department of National Defence and the Inspection Board of the United Kingdom and Canada has occupied an increasing proportion of the time of the staff. In addition, considerable testing was carried out for aircraft manufacturers, comprising tests on aircraft glues, metals, and components.

DIVISION OF LUMBER SEASONING

A study was made of the kiln-drying of eastern spruce in order to determine the best treatment to assure retention of the natural strength of the wood, which is a matter of particular importance in aircraft construction.

In the manufacture of aircraft the moisture content of wood parts is of the greatest importance. Assistance was rendered to aircraft plants in the conditioning of their plants so as to ensure reasonable uniformity of atmospheric conditions throughout the year. In addition a study was made of the effect of different storage conditions on aircraft plywood.

On account of a shortage of suitable air-seasoned material, an investigation was made of the kiln-drying of wood flooring blocks which were subsequently to be treated with creosote for floors in certain munitions plants. A large quantity of lumber treated with fire-retardants was kiln-dried for use in the construction of war vehicles.

In co-operation with a firm manufacturing rifles, a study was made of sugar maple and yellow birch to replace black walnut in gun furniture. Wooden blanks seasoned in the laboratories were forwarded for processing in the rifle plant.

Work was continued on the use of chemicals as an aid to seasoning difficult species and sizes; and air-seasoning studies of white pine were continued during the year.

DIVISION OF WOOD CHEMISTRY

In order to meet a demand for wood tar in the United Kingdom and domestic markets for the manufacture of tires, for the tarring of rope and oakum, and for other purposes, an investigation was carried out in co-operation with the Department of Trade and Commerce on the distillation of a suitable tar from Canadian woods. Work was conducted on red pine, jack pine, Douglas fir, ponderosa pine, and western larch.

In co-operation with the Department of National Defence an experiment was carried out on the acid-resistant treatment of maple battery boxes for tanks.

The laboratories co-operated with other authorities in an examination of the productive capacity of wood distillation plants and charcoal kilns for the production of unusually large quantities of charcoal required for special war purposes. A satisfactory solution was worked out.

Continued interest in the use of producer-gas to replace gasoline and diesel oil for the operation of internal combustion engines was manifested in the large number of requests which were received for information in this connection. Special interest was shown by pulp and paper companies, farmers operating tractors, and others operating where cheap wood is available.

Consideration was given to the problem of using large quantities of by-product sulphuric acid from certain war industries, in the production of alcohol from wood.

DIVISION OF TIMBER PATHOLOGY

In addition to fungi previously reported as actively destroying untreated jack pine railway ties, three other fungi causing serious decay have been identified. *Trametes americana* Overh. was found to have attacked approximately

45 per cent of the ties in an experimental track during a ten-years' service period. *Poria vulgaris* Fr. sensu Romell caused decay in 11 per cent of the ties; this fungus has not been reported frequently from Eastern Canada, but it has proved an important agent of destruction in the track. *Poria xantha* (Fr.) Lind was found to have completely destroyed one tie. A fourth fungus *Polyporus anceps* Peck was also identified among the fungi isolated from the ties, but was not associated with extensive decay.

Of 100 creosoted ties taken from the track, 15 yielded wood-destroying fungi. Of the fungi isolated *Lentinus lepideus* Fr. was the most active species in these ties.

Some 40 cultures of wood-destroying fungi were added to the collection.

The following wood-destroying fungi grown from spores collected from the air of a lumber yard were identified in culture: *Lenzites sæpiaria, Lenzites trabea,* and *Polyporus versicolor. Corticium coronilla* was also obtained. Many other spore cultures of Basidiomycetes from the air of the yards are retained for study.

Assistance was rendered to a pulp and paper company by studies made to determine the amount and distribution of bacterial infection in their plant. Based on the results of the study chemical treatment to eliminate "slime" was introduced into the mills. Subsequently, further studies were carried out to find out the effect of the treatment.

Tests were made for the Department of National Defence to determine the resistance to mould growth of glue and also of plywood for use in aeroplane construction.

DIVISION OF WOOD UTILIZATION

The laboratories co-operated with a Joint Committee of representatives of the lumber and pulp industries in finding practicable methods of using, for chemical pulp, about 400,000 cords of spruce sawmill waste destroyed yearly in refuse burners. Very encouraging progress was made in curtailing this waste. Several pulp companies are now using such material and others are experimenting with it.

Data obtained from previous studies of the cost of sawing spruce logs of different diameters were analysed. Although costs were found to vary widely from mill to mill, there is a general tendency for the costs of producing a given quantity of lumber from logs less than about 8 inches in diameter to increase sharply with decreasing size, but with logs over 8 inches the costs decrease relatively slowly with increasing diameter. Usually the amount of labour required to saw 1,000 board feet of lumber from 5-inch logs was found to be more than double that required to produce 1,000 board feet from 15-inch logs.

At the request of the Trade Promotion Committee of the Canadian Lumbermen's Association and with the support of the Governments of Quebec, New Brunswick, and Nova Scotia, and of lumber trade organizations in these provinces, the Forest Products Laboratories assisted in the formulation of grading rules for Eastern Canadian spruce lumber. To obtain the necessary data, field crews examined nearly 70,000 board feet of lumber at over a score of sawmills in the three provinces concerned. The field records are now being analysed in such a way as to ensure that the new grading rules will be soundly based on prevailing conditions and practices.

Investigations were carried out in connection with sources of supply and methods of production of woods used in the construction of aeroplanes. Assistance was rendered in formulating lumber specifications for military buildings; and a number of problems were dealt with pertaining to the use of wood in ship construction, the heating and insulating of military camps, and specifications for wood used in military equipment.

Exhibits of forest products were prepared for the New York World's Fair and for meetings of the Ontario Conservation and Reforestation Association.

DIVISION OF TIMBER PHYSICS

An extensive and detailed investigation was carried out of the density and general quality of spruce and balsam from a special area as compared with the average quality of these species in Eastern Canada. The timber in the area in question was found to contain very appreciable quantities of compression-wood which detracted from its value. The investigation showed the proportion of trees affected and the extent to which this character altered the wood from normal.

As compression-wood may often occur in large amounts in certain types of stand where trees are exposed to wind action, the commercial importance of this comparatively little known defect is becoming more widely recognized.

Assistance was rendered to the Royal Canadian Mounted Police in a smuggling case involving the proving that two pieces of timber found in different places originally were adjacent parts of the same board. The evidence provided was conclusive.

Identifications of wood samples of domestic and foreign origin were made on request of Government departments, users, and producers of timber. In some instances identification of pulpwood samples involved the examination of large amounts of material as in instances where it was necessary to determine the percentages of different species in shipments of mixed pulpwoods. It also included work on rifle furniture, field equipment, instruments, aeroplane plywoods, and other special products.

A shipment including various types of hickory was examined and recommendations were made to the Department of National Defence regarding specifications for different grades of handles.

In connection with the examination by microscope of glue bonds of synthetic resins, special methods were developed by the use of polarized light, as ordinary methods for animal and vegetable glues proved inadequate.

In co-operation with a firm of Canadian smoking pipe manufacturers, the possibility of using burls of birch and maple was investigated, also the roots of certain members of the heath family.

Studies were continued on the exudation of fluid resin through paint coatings on wood surfaces. The use of casein coatings on resinous woods gave promise of good results in controlling such exudation.

COMMITTEE WORK

Members of the staff of the laboratories served on the following Committees:—

The Canadian Engineering Standards Association.—Committees on Structural Timbers, Wooden Poles, Wooden Piling, and Fire Tests for Structural Materials.

The National Building Code.—Administrative Committee, Advisory Committee, Subcommittee on Wood Construction, Subcommittee on Fire Protection.

The National Research Council.—Aeronautical Research Committee; Subcommittee on Wooden Aircraft.

The Canadian Electrical Association.—Committee on Overhead Systems.

American Society for Testing Materials.—Subcommittee on Fibreboard and Fibreboard Containers.

The Canadian Pulp and Paper Association.—The Joint Committee of the Woodlands and Technical Sections; the Joint Administrative Committee of the Pulp and Paper Institute.

The Canadian Government Purchasing Standards Committee.—Subcommittees on Administration, Paint and Pigment Specifications, and Specifications for Chemicals.

PUBLICATIONS

Fire-retardant Paints.
Production of Charcoal.
Prevention of Checking in Air-seasoning Thick White Pine.
Forest Service Bulletin No. 94 "Density and Rate of Growth in the Spruces and Balsam Fir of Eastern Canada."
Some Problems of the Spruce Lumber Industry.

Vancouver Laboratory

The normal work of this laboratory had to be greatly curtailed on account of the necessity of devoting attention to problems of immediate importance in supplying timber of suitable quality and manufacture for war equipment and construction.

The following are the more important matters which received attention:—

DIVISION OF TIMBER MECHANICS

Tests were carried out on yellow cedar which is used extensively in boat construction and on Douglas fir from a high altitude in order to find the effect of site on the mechanical properties of this species.

A special study was carried out to determine the effect of different temperatures and humidities in a dry-kiln on the mechanical properties of Sitka spruce for aeroplane construction.

Extensive tests were carried out on glued joints in timber and plywood, many of which were for the purpose of determining whether different commercial glues complied with specifications laid down by war services, particularly with respect to the strength of the bond and its resistance to deterioration in use under moist conditions.

Arrangements were completed to carry out a series of tests on air-dried Douglas fir and western hemlock timbers in three merchantable grades defined by the British Columbia Lumber and Shingle Manufacturers' Association Export Grading Rules, and in five different dimensions, from material selected from a number of producing areas in British Columbia. This involves the testing of more than 2,500 pieces of timber.

An officer of the laboratory co-operated with the office of the Timber Controller, with producers of spruce, and with manufacturers of aeroplanes in the interpretation of specifications for Sitka spruce and in settling special problems which give rise to a difference of opinion among interested parties.

Extensive tests were conducted on western white birch veneers and plywood with the result that it was accepted as an alternative species for yellow birch.

As a result of tests carried out on ten coldpress resin glues, six were accepted as conforming with Royal Canadian Air Force requirements and were admitted for use in aircraft.

An examination of the situation with respect to Engelmann and white spruce from interior British Columbia showed that appreciable quantities of a grade suitable for aircraft construction could be obtained as an alternative supply to Sitka spruce.

Attention was given to the suitability of yellow cedar for aeroplane propellers, as a substitute for mahogany in small boat construction, and for other special purposes, particular attention being paid to ways of using the lower grades.

Samples of arbutus stem, burl, and root burl sections and of western yew stem were submitted to a large smoking pipe manufacturer in England for test as a substitute for briar.

DIVISION OF TIMBER PRODUCTS

A study of the rate of moisture absorption in storage of red alder, broad-leaved maple, and western birch was brought to a conclusion. Assistance was provided a large furniture manufacturing firm in developing plans for proper manufacturing and storage to ensure satisfactory service of furniture, produced on the Coast, when it is shipped to areas in Canada where atmospheric humidity is materially lower than it is in British Columbia.

Data, based on studies made by the laboratory, were assembled for the British Columbia lumber industry, with regard to changes in moisture content, the effect of kiln-drying upon stain and decay in transit and other factors affecting lumber cargoes passing through tropical waters.

An investigation on the effect of the type of case (wooden or fibre) on the rusting of canned goods during ocean shipment, which has been carried on for some time in co-operation with the Research Committee of the Association of Marine Underwriters of British Columbia was completed.

Plans were prepared for a study of the rate of air-seasoning of true fir (Abies spp.), on account of growing preference for this lumber for certain uses.

A study of the rate of air-seasoning and the moisture gradient in Douglas fir and western hemlock ties was completed with a view to determining the most satisfactory method of preparing ties for creosote treatment.

Investigations for the purpose of developing drying schedules were carried out on (1) yellow cedar venetian blind bolts and slats; (2) Noble fir (*Abies nobilis*), for the construction of aeroplane screws; (3) western hemlock tea chest slats for the United Kingdom; (4) Douglas fir decking for pontoon bridges.

A study was completed to determine the effect of seasoning on Douglas fir timbers treated with zinc chloride, particularly as it affects shrinkage and distortion of preframed timbers when subjected to high atmospheric temperatures.

A study was undertaken to test the effect of prolonged bulk-piling upon urea-treated timbers, with a view to the possible use of this method in the shipment of timbers through tropical waters.

Assistance was given to two large factories, producing high-grade veneer from western birch for aeroplane purposes in determining the characteristics and properties of this wood.

Information was assembled on the effect of drying to a moisture content of 20 per cent on the development of stain in a consignment of western hemlock for the United Kingdom. Pathological studies were made of infected aspen logs which had been shipped to South Africa for cutting into match veneers, and of a shipment of aspen logs for China.

Attention was given to the durability of red alder when used for pit props in coal mines; to a comparison of the rot-resisting qualities of kiln-dried and green shingles; to the durability of kiln-dried material used in scow construction; to methods of protecting garden structures from rot; and to the cause of decay of poles in a power transmission line crossing a body of lava ash soil.

Wood specimens were examined to determine the extent and cause of decay, or to explain the reason for natural defects of an unusual nature. Of particular interest amongst these were: the cause of "white streak" in western birch; unusual defects in Sitka spruce; the cause of green stain frequently found in standing Douglas fir from certain sites.

Assistance was extended to the British Columbia Lumber and Shingle Manufacturers' Association in the revision of their grading rules for structural timbers.

COMMITTEE WORK

The British Columbia Lumber and Shingle Manufacturers Association—Grading Rules Committee.

Association of Marine Underwriters of British Columbia—Research Committee on Shipping Containers.

PUBLICATIONS

Forest Service Circular No. 57, "Sap-stain, Mould and Decay in Relation to Export Shipments of British Columbia Softwoods".

Factors Affecting the Drying of Lumber, Rough and Surfaced.

Some Technical Problems of War-time Lumber Supply.

The Pulp and Paper Research Institute of Canada, Montreal

For several years the Pulp and Paper Division of the Forest Products Laboratories has devoted attention to research and testing in the field of pulp and paper. During a large part of that time the laboratory has functioned through an agreement with the Canadian Pulp and Paper Association. Close collaboration was also maintained with McGill University.

On August 1, 1940, a new agreement came into effect between the Dominion Government, the Canadian Pulp and Paper Association, and McGill University, whereby the pulp and paper research work of the three bodies was placed under one director responsible to a Joint Administrative Committee consisting of representatives of the three interested bodies.

The research work carried out at the Institute is of two general types: fundamental and applied.

FUNDAMENTAL RESEARCH STUDIES

These are studies of a basic nature carried out with the object of extending scientific knowledge.

Among such problems undertaken during the past year a number dealt with the structure of lignin, one of the principal constituents of wood. This, it is hoped, will lead in the near future to applied research having as its objective the utilization of lignin.

New methods for the extraction of lignin from wood have been developed and an ethanol extraction method whereby 97 per cent of the lignin is removed, and which is applicable to the usual wood chips, holds promise of commercial application.

A new method for fractionation of high polymers, probably applicable to the fractionation of pulps, has been developed.

Considerable progress has been made on the hydrogenation of wood and lignin which is not only of interest in connection with the structure of lignin, but when carried out at lower temperatures offers a possibility for pulp recovery and lignin utilization.

The heats of adsorption of sulphur dioxide on wood at 90 degrees centigrade have been measured and equipment developed for measuring the heat of delignification during sulphite cooking.

A new technique has been developed for the measurement of the absolute surface of fibrous materials. The influence of beating and other factors on the specific surface of pulps is being studied.

Water vapour absorption measurements on pulp are being carried out at low temperatures. This work has for its objective an attempt to determine the shift in the relative amount of bound water with temperature. Specific heat measurements indicated that this is the case.

APPLIED RESEARCH STUDIES

A study is being made of the grinding process of making wood-pulp wherein a revolving grindstone breaks up the wood which is pressed against it into very small fibrous pieces. Thorough tests have been carried out to determine the influence on the quality of the pulp exerted by the character and speed of the stone surface, the grinding pressure, and other conditions of grinding.

The investigation of the quality of paper for purposes of printing was continued. In particular an attempt is being made to measure the quality of any given piece of printing. An effective set of equipment has been designed and assembled whereby the reflectance of a small enough area can be measured.

For the past few years, the manufacturers of box-board have been asking for some measure of its folding quality to guide them in making a satisfactory product economically. A folding tester has been designed and approved by several manufacturers. It will soon be constructed and tested under practical working conditions.

For years the industry has been hoping that a satisfactory method of determining the concentration of a pulp suspension would be found. Equipment has now been designed whereby it is hoped this measurement can be made by means of an electrical conductivity method. The construction of the apparatus is nearing completion.

A considerable amount of investigational work was carried out in connection with the yield and quality of woods from certain forest areas.

A number of samples of building papers were subjected to a variety of tests for the purpose of providing information for use in setting up specifications for building papers.

WAR WORK

During the past year the facilities of the Institute were made available for work connected with the present war emergency. As a result, much testing, scientific in character but of practical application, was undertaken for the Canadian Government and the various British Missions in this country. Work of a confidential nature in the national interest was also carried out, particularly in problems for which Institute facilities are especially suited.

INDUSTRIAL CO-OPERATION

The Institute co-operated with a number of companies in the solution of 857 minor technical problems. This included calibrations and inspections of standard testing apparatus and parts thereof which had been developed at the Institute.