CANADA
DEPARTMENT OF MINES AND RESOURCES

REPORT

OF

LANDS, PARKS AND FORESTS BRANCH

FOR THE

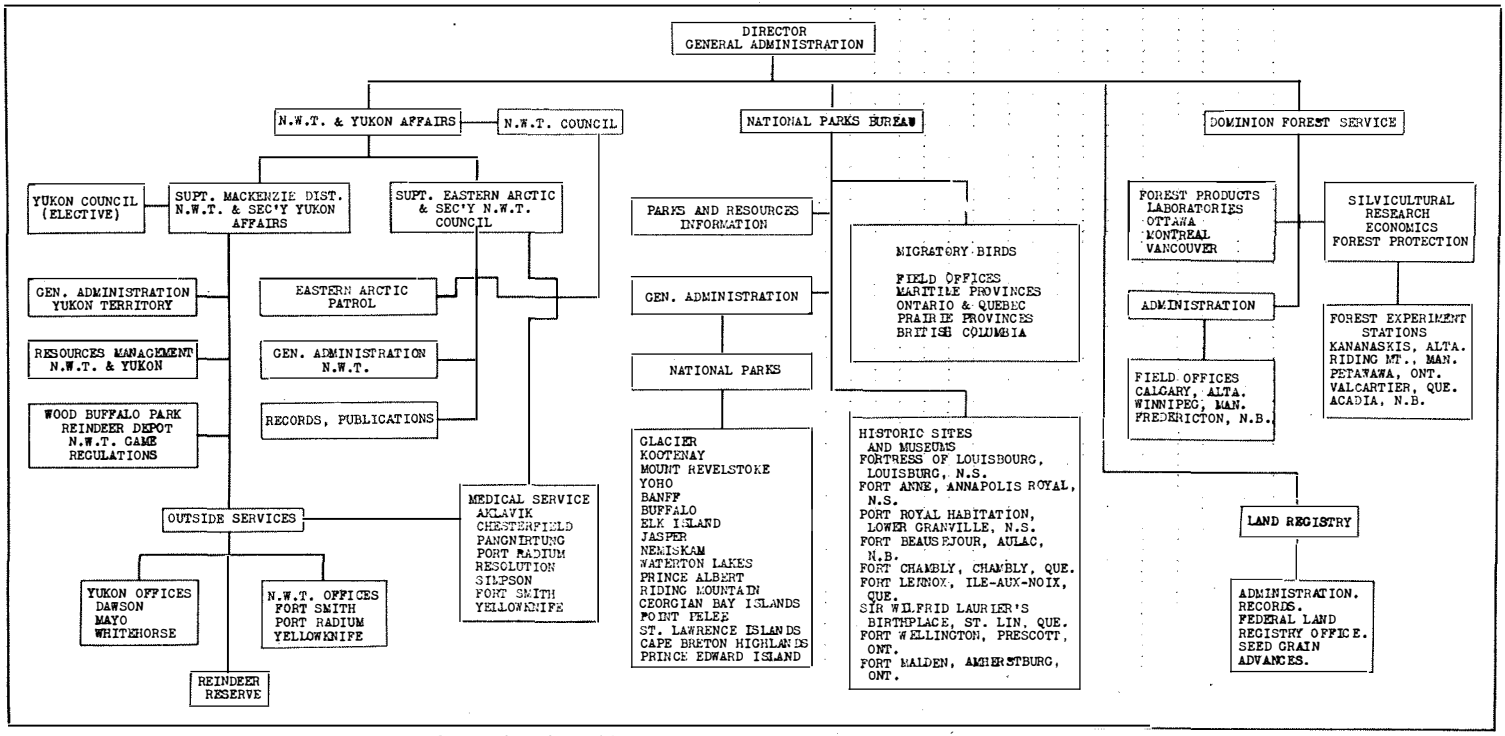
FISCAL YEAR ENDED MARCH 31, 1939

(Reprinted from the Annual Report of the Department of Mines and Resources Pages 68 to 167 inclusive.)

OTTAWA
J. O. PATENAUDE, I.S.O.
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1940

CONTENTS

98150—1½



Organization Chart, Lands, Parks and Forests Branch

LANDS, PARKS AND FORESTS BRANCH

ROY A. GIBSON, DIRECTOR

The Lands, Parks and Forests Branch administers the mineral, fur and other resources of the Northwest and Yukon Territories, and deals also with any business arising from the local government of the two Territories. It administers the National Parks of Canada and gives a lead in the conservation of wild life, marks historic sites of national importance, and assists in the encouragement of travel. It conducts scientific investigations relating to the safeguarding, management, and maximum utilization of the forest resources of the Dominion, maintaining forest experiment stations and forest products laboratories. A Land Registry Office, which deals with land owned by the Dominion in the various provinces, is also maintained.

The Branch comprises four main bureaux or services and the chart herewith indicates the plan of organization. The activities of the Branch extend to every province and territory of the Dominion.

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 freshwater 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, due to the mining activity which 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, S. T. Wood.

Secretary—D. L. McKeand.

Work of Council

Twelve regular sessions of Council were held during the year and several important matters came up for consideration.

Assent was given to an ordinance in respect of businesses, callings, trades and occupations and the issue of licences thereunder. Separate ordinances were approved in connection with chemists and druggists (pharmaceutical) and insurance agents. Some consideration was given to draft legislation for the control, regulation and sale of liquor and for the administration of purely local affairs at Yellowknife. The Committee on the revision of the Northwest Territories Ordinances reported progress and several obsolete ordinances were repealed. An amendment to the Northwest Territories Act was recommended to authorize the inspection of baggage in transit as a means of preventing illegal transportation of fur.

The organization and itinerary of the annual Eastern Arctic Patrol was arranged.

A number of applications for permits to make exploratory and scientific investigations in the Northwest Territories under the terms of the Scientists and Explorers Ordinance were dealt with and reports of expeditions considered.

Various measures were considered in reference to game conservation of which the following might be specially noted: limitation of the issue of hunting and trapping licences; creation of Mackenzie Mountains Game Preserve; wolf bounty; restriction of aeroplanes in trapping operations; muskrat conservation development in Wood Buffalo Park and other suitable locations; inclusion of tidal water areas in Hannah Bay Waterfowl Sanctuary, Ontario, and Northwest Territories; creation of Twin Islands Game Sanctuary in James Bay; development of eiderdown industry. Other questions dealt with included: sanitation and pure water supply at settlements in Mackenzie District; public works improvements, including Grimshaw-Great Slave Lake road; aids to navigation; radio services; forest conservation; hospitals and medical services; administration of justice; freight rates to Northwest Territories; establishment of liquor store at Yellowknife; grant to school at Yellowknife; reindeer affairs; operation of trading posts; new post offices; agricultural development; water power.

An inspection trip to Fort Smith and the Yellowknife Mining District was made by Dr. Charles Camsell in the summer of 1938, and Mr. R. A. Gibson and Mr. A. L. Cumming inspected various settlements and mining areas in the Mackenzie District.

A committee was formed to study conditions of employment in the Northwest Territories.

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. To facilitate the administration of justice a qualified barrister was also appointed Stipendiary Magistrate and stationed at Fort Smith during the year preparatory to being assigned to Yellowknife. A member of the Royal Canadian Mounted Police at Port Radium is Dominion Lands Agent, Mining Recorder, and Crown Timber Agent. A member of the Force also acts as Sub-Mining Recorder at Yellowknife.

Medical Officers

Medical Officers employed by the Department are stationed at Fort Smith, Resolution, Simpson, Norman, Aklavik, Port Radium, Yellowknife, Chesterfield, and Pangnirtung. To facilitate medical administration, the Territories have been divided into medical districts over which the resident Medical Officers have jurisdiction. They are responsible for the general health and welfare of the native population. Extensive patrols are made to outlying areas when conditions permit, and contact is maintained at all times of the year by means of the radiotelegraph service. All doctors have been appointed coroners, and also act as Medical Health Officers in order to enforce the sanitary regulations. They also supervise the various mission hospitals, residential schools, and industrial homes.

Hospitals

During the year, a new Roman Catholic Mission hospital was opened at Resolution, bringing the total of such institutions up to eight, exclusive of the hospitals operated by the mining companies at Yellowknife and Port Radium. The regular hospitals are situated within the principal settlements and are operated by the Anglican and Roman Catholic Missions. An arrangement has been in effect with the Mission authorities for the treatment of indigent whites, Eskimos, and half-breeds, at a rate of $2.50 per diem. Payment to the hospitals totalled $23,042.50, representing 9,217 days' treatment. In addition the sum of $3,670.70 was paid for the maintenance of mental or other patients in provincial institutions. Industrial homes, where the aged and infirm are cared for and taught native handicrafts, are operated in conjunction with the hospitals at Chesterfield and Pangnirtung. The Department pays for the care and maintenance of each inmate on the basis of $200 per annum. The sum of $2,419.25 was expended under this heading. These figures do not include the amounts paid by the Indian Affairs Branch for Indians.

Schools

Residential and day schools are maintained by the Roman Catholic and Anglican Missions, assisted by grants from the Dominion Government. During the year 306 white, Eskimo, and half-breed children were enrolled in the residential schools and 134 attended the day schools. The sum of $24,205.74 was expended for educational purposes in addition to a small amount for school supplies. This figure does not include the 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. The Grimshaw-Great Slave Lake winter tractor road is also providing a further means of access. During the past year the water transportation companies handled approximately 20,000 tons of freight in addition to that consigned to Eastern Arctic points. The aeroplane companies carried in excess of one million pounds of freight in connection with their Northwest Territories operations. Scheduled flights are maintained throughout the year except for a short time during the freeze-up and break-up periods. Chartered flights may be arranged to practically any part of the Territories. During the year winter aeroplane landing fields and seaplane bases were further improved to meet the increasing needs.

Communications

As in previous years, the Northwest Territories and Yukon radio system operated by the Department of National Defence (Permanent Force) continued to serve a very useful and necessary purpose, likewise the wireless stations 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 Brabant (seasonal), Port Radium, 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), P.Q. 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. During the past year the scheduled mail flights to Fort Smith totalled 94 with a lesser number to more northerly points.

Law and Order

Law and order in the Territories are enforced by the Royal Canadian Mounted Police. Detachments have been established at the more important settlements and extensive patrols are made to outlying areas. The Departmental Agent stationed at Fort Smith, has been appointed Sheriff of the Northwest Territories. To facilitate the administration of justice four Stipendiary Magistrates have been appointed.

Vital Statistics

The Vital Statistics Ordinance of the Northwest Territories has been in force since January 1, 1927. A system of record similar to that adopted by the provinces was set up at that time to deal with whites, Eskimos, half-breeds, and non-Treaty Indians. Later the system was extended to include Treaty Indians. The information gathered under this system is furnished the Dominion Bureau of Statistics for inclusion in the Vital Statistics of the Dominion. The Director of the Branch is Registrar General for the Northwest Territories.

Liquor Permits

The Northwest Territories Act, Chapter 142, R.S. 1927, authorizes the importation of intoxicating liquors to eligible persons under permit issued by the Commissioner. During the past year 1,332 such permits were issued covering 2,406⅓ gallons of spirituous liquors, 11 gallons of wine, and 70½ barrels of beer. With the discovery of precious metals, particularly in the Yellowknife-Great Bear Lake area, the white population of the Mackenzie District has steadily increased. These new residents, the majority of whom formerly resided in provinces where they were privileged to purchase spirituous liquors, wines, and beer, petitioned the Commissioner to extend this privilege to Yellowknife Settlement. The matter was under consideration at the close of the fiscal year.

Aids to Navigation

This work was carried out by the Department of Transport under the direction of our Agent, Mr. Meikle. Existing aids were maintained at all points between the delta of Athabaska River and Great Bear Lake.

Land and Timber

Lands 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 Port Radium and Yellowknife, surface leases are granted for the same purposes. At Port Radium there are 19 leases in force.

A reservation of land for a settlement at Yellowknife, which lies about 615 miles almost due north of Edmonton, was made by Order in Council P.C. 968 of May 3, 1938. A survey was commenced and, during the summer, 9 blocks were laid out, 7 of which were subdivided into 126 lots. Surface leases for five-year periods are being granted, and, up to the end of the year, 92 such leases had been issued.

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 21. There are also 4 grazing leases in force and, during the year, 9 hay permits were issued under which 84 tons of hay were cut.

The number of timber permits issued, exclusive of those granted in connection with timber berths, was 96, authorizing the cutting of 37,108 lineal feet of timber, 23,000 feet board measure of saw timber, 20 fence posts, 105 roof poles, and 8,750 cords of wood. Twenty-six of these permits were issued free of dues to educational, religious, and charitable institutions; to settlers for domestic use, and to Government departments. Eighteen timber permit berths were granted. The revenue derived from lands, timber, grazing, and hay was $11,771.45, being an increase of $5,540.08 over the previous year.

Mining

The year under review was exceptionally active in the Yellowknife area where gold was discovered in 1935. In 1936 a discovery of gold was made at Gordon Lake and in 1937 gold was found at Moberly Lake and at Snare River. Further discoveries of gold-bearing quartz were made in 1938 at Sunset Lake (Beaulieu River), Murray Lake, McDonald Lake, Thompson Lake, Pensive Lake, and Wray Lake, and exploration and development work were conducted in these several areas.

The "Con" claims were staked near Yellowknife Bay in the autumn of 1935, the "Negus" property being staked in the same area in January, 1936. The start of actual gold production was signalized on September 5, 1938, when the first gold brick, weighing 72½ pounds, was poured at the "Con" mine of the Consolidated Mining and Smelting Company. By the end of March, 1939, gold valued at more than $400,000 had been produced from this mine. The first gold brick was poured at the "Negus" mine owned by Negus Mines, Limited, on February 21, 1939, since which time production has continued at the rate of more than $50,000 monthly.

The pitchblende-silver property of Eldorado Gold Mines, Limited, at Labine Point, Great Bear Lake, has been developed to a depth of 890 feet, with seven levels opened. The mill on the property handled about 100 tons daily, producing an average of 80 tons of concentrates monthly. These concentrates were shipped to the company's refinery at Port Hope, Ontario, for treatment—radium, silver, and uranium by-products resulting from such treatment. Additions to the plant included two new Diesel engines and a new 70,000-gallon fuel oil storage tank. The mine now has a storage capacity of 250,000 gallons of fuel oil.

Miners' licences issued during the year numbered 1,158 and 620 such licences were renewed. Entries were granted for 4,584 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 7,585. Final leases have been issued comprising an area of 7,476·35 acres. The total revenue obtained from fees payable under the Quartz Mining Regulations amounted to $65,602.90, including $13,606 collected as licence fees.

Placer Mining.—Of more than 300 claims staked and recorded in the South Nahanni and Liard River districts since 1934 only 25 are now in good standing. Placer mining fees amounted to $291.

Coal.—Six coal mining leases are in force, comprising an area of 536·60 acres. The total revenue derived from fees, rentals, and royalties in connection with coal mining rights during the year amounted to $439.36.

Petroleum and Natural Gas.—Petroleum and natural gas leases affecting lands in the Northwest Territories comprise a total area of 3,173·33 acres. Petroleum produced from the wells of Northwest Company, Limited, below Norman on Mackenzie River, amounted to 24,067·9 barrels during the year. Most of the oil was shipped to the Great Bear Lake, Yellowknife, and Gordon Lake mining fields. Revenue from petroleum and natural gas locations totalled $1,791.36. Two oil and gas permits were issued during the year, comprising in all an area of 5,120 acres.

Dredging.—One dredging lease is in force in the Northwest Territories, comprising a stretch of an unnamed river lying about 70 miles west of the point where Gossage River joins Mackenzie River. Rental paid on this lease during the year amounted to $50.

Northwest Game Act and Regulations

During the past year several amendments to the Northwest Game Regulations were made with the object of conserving the wild life for the native population.

Order in Council P.C. 976, dated May 3, 1938, established the Mackenzie Mountains Game Preserve situated to the west of Mackenzie River and north from Liard River to the boundary of the Peel River Preserve, comprising 69,440 square miles.

Order in Council P.C. 977, dated May 3, 1938, limits the issue of hunting and trapping licences to—

1. Residents of the Northwest Territories as defined by the Game Regulations who, on May 3, 1938, held hunting and trapping licences and who continue to reside in the Northwest Territories.
2. The children of those who have had their domicile in the Northwest Territories for the past four years, provided such children continue to reside in the Northwest Territories.

Order in Council P.C. 1708 dated July 20, 1938, provides for the payment of a bounty of $10 on each mature wolf and $5 on each wolf pup killed in the Northwest Territories or in the Wood Buffalo Park on and after October 1, 1938.

Order in Council P.C. 2470 dated October 4, 1938, prohibits the use of aircraft as a means of transportation to or from or within the Mackenzie Mountains Game Preserve in connection with hunting or trapping operations.

Up to March 31, 1939, a total of 583,997 square miles had been set aside as game preserves, in which only natives were permitted to hunt and trap. Wood Buffalo Park, 17,300 square miles, Thelon Game Sanctuary, 15,000 square miles, and the Reindeer Grazing Preserve, 6,600 square miles, are additional reservations which have been established in the interests of the wild life.

Wood Buffalo Park.—During the winter of 1938-9 the wardens carried out patrols in the southern part of the park with the intention of obtaining an estimate of the buffalo population. They were unable to make a detailed survey of this large area (6,300 square miles) and climatic conditions, especially heavy snowfalls, were factors which precluded the possibility of securing a satisfactory estimate of the buffalo in that district. A further effort is to be made during the winter of 1939-40. This investigation will be extended to cover the whole of the park as time permits.

Under the supervision of the park superintendent the wardens continued their efforts to exterminate undesirable predatory animals and twenty-one wolves were taken by them during the winter of 1938-9. Further progress was made in the construction of cabins and additional fire control equipment was installed.

Mr. J. L. Grew was engaged for part of the year to make an investigation of the wild life conditions in Wood Buffalo Park and to determine the feasibility of effecting improvements to restore the water levels in certain areas which, in former years, produced a good yield of mink and muskrats. Mr. Grew, after consultation with the park superintendent, carried out an investigation in the southern area of the park with the aid of the warden staff. He recommended immediate action upon construction of dams and retaining walls to impound the waters of the Murdock Creek drainage area during the spring run-off of 1939. Authority was granted to proceed with this work and it was completed by winter, except for some minor details in connection with the dam.

During 1938 the sum of $6,714.13 was expended in connection with the Murdock Creek conservation project. This included the cost of tools and materials in addition to providing for the payment of wages for labour for a total of 11,424 man-hours.

The natives have been notified that they will not be allowed to trap muskrats in the Murdock Creek area until the muskrat population has increased to an extent that would justify trapping operations.

Mr. Grew also investigated the possibilities of improving conditions for wild life in the Buffalo Lake area, which is in the northwesterly sector of the park, and he also examined the Egg Lake, Dempsey Creek, and Horse Island areas in the southerly part of the park. He has recommended that fur conservation projects be undertaken in each of these areas.

Arrangements were made for park warden M. J. Dempsey to investigate wild life conditions in the district between Fort Smith and Simpson and to report upon certain representations made to the Department urging changes in the game regulations. He left Fort Smith on January 7, 1939, and reached Simpson on February 12, returning to Fort Smith on March 23. He interviewed a total of 122 fur traders and trappers en route, who completed questionnaires giving their observations upon the wild life situation.

A number of persons requested the payment of a higher bounty for the destruction of wolves and an increase in the bag limit for beaver. The majority of the residents, however, considered the game regulations to be generally satisfactory. Park Warden Dempsey's report indicated that marten are very scarce in the greater part of the district which he investigated and that there is a shortage of beaver in the area lying between Slave River and Taltson River. His recommendations are being considered by the Department.

Fur and Game.—The returns from a number of outlying posts have not as yet been received, therefore, complete game statistics for the fiscal year ended March 31, 1939, are not available. The following statement has been prepared from the returns for the licence year ended June 30, 1938, received in the Department to date.

Preliminary statement of pelts of fur-bearing animals taken during year ended June 30, 1938.

Bear, black	65	Fox, red	5,658
Bear, brown	7	Fox, silver	344
Bear, grizzly	2	Fox, white	49,159
Bear, white	140	Lynx	936
Beaver	12,466	Marten	6,195
Coyote	53	Mink	3,523
Ermine	15,986	Muskrat	413,362
Fisher	22	Otter	323
Fox, blue	499	Skunk	45
Fox, black	12	Wolverine	137
Fox, cross	2,428	Wolf	1,389

Preliminary statement of big game animals and birds taken during licence year ended June 30, 1938.

Deer	42	Grouse	324
Caribou	18,071	Prairie chicken	817
Moose	1,205	Ptarmigan	7,619
Sheep	162	Wild duck	11,359
Partridge	1,108	Wild goose	1,391

Buffalo.—Climatic conditions during the past year appear to have been favourable to the buffalo. According to the reports of the wardens there were no unusual losses to the herds. In accordance with the customary practice thirty surplus buffalo were slaughtered during the winter season. The meat of the animals was allotted to missions and hospitals and to the Indian Affairs Branch for distribution to needy native families in districts adjacent to the park.

Caribou.—Reports indicate that in the majority of districts within the range of the barren ground caribou these animals were fairly plentiful during the past year. At a number of isolated points, however, the natives experienced difficulty securing sufficient for their needs. Investigations were made into the alleged excessive slaughter of caribou in the Burnside River and Red Rock Lake districts referred to in the annual report of last year and, following a study of the reports, the Advisory Board on Wild Life Protection recommended that the efforts of the Department to educate the natives to conserve this wild life resource be continued. Many of the Eskimos living in the districts mentioned depend upon caribou for food throughout the year.

A scarcity of woodland caribou and moose was reported from a number of points and residents of the district to the north of Great Slave Lake reported that the many large fires which have taken place in that area during recent years are largely responsible for the shortage of these animals.

Musk-ox.—No reports upon the condition of the animals in the Thelon Game Sanctuary were received during the year. The Royal Canadian Mounted Police have re-established the post at Baker Lake and the officer in charge planned to make a journey to the east end of the Thelon Game Sanctuary during the months of February and March, 1939, to investigate the activities of the natives in that area. The report on this patrol will not be available until August, 1939.

The natives of the Beverley Lake district make a practice of entering the sanctuary for the purpose of securing wood for building sledges, etc. The Royal Canadian Mounted Police have obtained an aeroplane to assist the field officers in supervising the game laws, and special consideration will be given to the situation existing at the eastern end of the Thelon Game Sanctuary.

Moose.—A total of 1,205 moose was taken during 1937-8 as compared with 1,289 for the previous year. There has been a steady decline in the number of moose taken during recent years.

Beaver.—The open season—March 1 to May 31—established in 1937, appears to be satisfactory. The regulations under which male residents over eighteen years of age may be granted a permit to take fifteen beaver during the open season remained in effect. The number of beaver permits issued was 1,306 and 12,466 beaver were taken. Since the adoption of the beaver regulations in 1932 the average annual yield of beaver pelts has been approximately 11,500 pelts.

Fox.—There was a considerable increase in the yield of white fox pelts for the season of 1938, indicating that the cycle is following its normal trend. The returns of fox pelts taken during the past five years were as follows:—

Year ended June 30	White fox	Red fox	Cross fox
1934	52,467	8,763	3,668
1935	52,615	11,789	4,875
1936	25,897	9,556	4,074
1937	19,854	5,988	2,976
1938 (preliminary report)	49,159	5,658	2,428

In addition the preliminary returns for 1937-8 show 12 black, 499 blue, and 344 silver fox.

Marten.—The yield was 6,195 pelts, which approximates the average number taken each year for the past ten years. The establishment of the Mackenzie Mountains Game Preserve will, it is hoped, eventually result in a greater yield of marten pelts because it embraces a large part of the habitat of the marten in the Mackenzie District and trapping will be better controlled in that area under the preserve regulations.

Mink.—The number of mink pelts taken was 3,523. This is the lowest yield since 1922, from which time accurate records of the fur yield have been maintained. The mink is subject to violent fluctuations in numbers and for the year ended June 30, 1933, the yield of mink pelts was 18,715. It would appear that the period of low production during the present cycle has now been reached.

Muskrat.—A total of 413,362 pelts was taken, as compared with 218,923 for the previous year. The normal open season for muskrat extends from March 1 to May 31 in the district south of the Arctic Circle. Due to a scarcity of other forms of wild life in the southern part of the Mackenzie District it was necessary to extend the open season for muskrats to cover the period January 15 to May 31 in this area, as a relief measure. This additional trapping only partially accounted for the increase in the number of muskrat pelts because there was a corresponding increase in the Mackenzie River Delta where the extended open season did not apply.

Wolf.—In consequence of representations made to the Department, the regulations were amended to provide for the payment of a bounty of $10 on and after October 1, 1938, on each mature wolf and $5 on each wolf pup killed in the Northwest Territories or in the Wood Buffalo Park. A total of $10,505 was paid for the destruction of 1,817 wolves during the fiscal year ended March 31, 1939.

Fur Export Ordinance.—The sum of $97,760.92 was obtained as revenue under the Fur Export Ordinance during the year ended March 31, 1939, compared with $57,061.68 for the previous year. The increase in the yield of white fox and muskrat pelts was largely responsible for the improvement in the revenue.

Licences.—Licences were issued during the licence year ended June 30, 1938, as follows:—

Hunting—	
Resident	505
Non-Resident British	1
Non-Resident Non-British	3
Non-Resident Bird Licence	7
Trading—	
Resident	145
Non-Resident British	8

Infractions of Game Laws.—There were twenty-four prosecutions and twenty-one convictions for infractions of the game laws.

Permits.—Permits were issued or dealt with as indicated below:—

To establish trading posts	23
To take mammals for propagation purposes	2
To hunt and trap in Wood Buffalo Park	365
To render Migratory Birds permits operative in N.W.T. (Countersigned)	13
To take specimens of mammals and non-migratory birds for scientific purposes	8
To take fifteen beaver	1,306

Revenue.—The revenue collected under the Northwest Game Act and the Fur Export Ordinance for the fiscal year 1937-8 was as follows:—

Hunting licences	$ 1,632 32
Trading licences	1,644 14
Bird licences	35 00
Fur-farm licences	13 00
Trading post permits	23 00
Sale of furs	514 43
Fur Export Tax	97,760 92
Fines and forfeitures	145 00
	$ 101,767 81
Revenue under Businesses, Callings, Trades, and Occupations Licence Ordinance	2,542 50
Total	$ 104,310 31

General.—Reports by departmental field officers and Royal Canadian Mounted Police officials from practically all points extending from the Eastern Arctic to the Mackenzie District indicate that generally speaking the natives of the Northwest Territories have enjoyed good health and satisfactory hunting conditions have prevailed.

Reindeer

The Government reindeer enterprise in the northern Mackenzie District continued to make progress. At the round-up on Richards Island in midsummer 1938, there were more than 4,500 deer. The official count of fawns for the year was 1,281 head. The round-up was attended with unusual difficulty on account of high winds which interfered with the driving of the deer to the corrals and also endangered water craft used in the transportation of men and supplies.

The reindeer were reported to be in excellent condition and as usual the round-up was taken as an occasion to balance the herd in regard to male and female stock and to select surplus animals for slaughter in the autumn. The round-up also afforded an opportunity to demonstrate to visiting natives the handling of the deer.

During the last week in September, shortly before freeze-up, 286 deer, consisting of mature steers and aged females, surplus to herd requirements, were slaughtered for meat purposes. The allotments to the Anglican and Roman Catholic Missions in the Mackenzie Delta area were increased from 65 head in previous years to 80 head for each Mission. These were mainly old females of an average dressed weight of 130 pounds, the average weight of the steers being 167 pounds. The remaining deer slaughtered at this time provided meat for camp use, medical officer (Aklavik), relief, and sale. Six of the carcasses were disposed of in lieu of wages for extra help required at the round-up. Subsequent slaughter during the winter increased the total for the year to more than 300 head. The number of carcasses sold to the end of the fiscal year was 61, providing a total revenue of $1,526.

In September, 1938, one of the remaining Laplanders brought from Norway in 1931 returned to his home, leaving only one Laplander at the Reindeer Station. He was assisted by two experienced Eskimos from Alaska and four native apprentice herders. The entire herding staff was under the direction of the General Foreman and a supervising officer at the field camp. Dr. J. A. Urquhart, who has had general supervision over the Reindeer Station for several years, was transferred from Aklavik to Fort Smith, his supervisory duties being assumed by the General Foreman.

The communication facilities between the Reindeer Station and Aklavik were improved by the installation of two-way radiophone equipment at the Reindeer Station, operating in conjunction with the Signals Station of the Department of National Defence at Aklavik. This has proved a valuable link with the Administration office at Ottawa. Improvements have been effected in warehouse facilities and herder's cabins at the Reindeer Station.

An important development in December, 1938, after the movement of the reindeer herd from Richards Island to the winter range on the mainland, was the separation of a part of the herd comprising about 950 deer and the movement of this smaller herd across the Eskimo Lakes to a location in the vicinity of Anderson River about 150 miles east of the reserve. This herd has been established under native management with the departmental chief herder in charge. The natives entrusted therewith are Charlie Rufus, trained as an apprentice herder, and his father, Rufus Kalealuk. The conditions under which the deer are loaned to the natives are set forth in an agreement which conforms with the arrangements discussed between Dr. Urquhart and the natives. Provision is made for reclaiming the herd if not properly handled and for the return eventually of a herd similar in size and composition to the one loaned.

The Interdepartmental Reindeer Committee met on May 30 and October 28, 1938, and February 27, 1939.

Eastern Arctic Patrol

The annual patrol to the Eastern Arctic on board the R.M.S. *Nascopie* of the Hudson's Bay Company was again a feature of Government administration during the year. The Commissioner of the Northwest Territories was shown over the vessel prior to its departure from Montreal and was afforded an opportunity to inspect the ship's equipment and personnel. The *Nascopie* sailed from Montreal on July 9 and returned to Halifax on September 19, after completing a successful voyage.

Major D. L. McKeand, Superintendent of the Eastern Arctic, was again Officer in Charge of the Government party and representative of the Department of Mines and Resources in the northern archipelago. The party included Dr. Keith Rogers, medical officer and ship's doctor; F. R. E. Sparks, of the Post Office Department; D. A. Nichols, physiographer; T. M. Shortt, ornithologist; F. H. Varley, artist; J. J. Bildfell, special investigator; Corporal MacBeth, of the Royal Canadian Mounted Police; and Mrs. Marion Grange, historian. Superintendent T. B. Caulkin, of the Royal Canadian Mounted Police, joined the patrol at Churchill. Although the Government party was smaller than

usual, considerable administrative and scientific work was accomplished. Regular meetings were held to discuss topics of interest and to co-ordinate activities at the various ports of call.

Hebron on the Labrador Coast, where the *Nascopie* made its first call to discharge mail and supplies, had been selected as an advance base instead of Port Burwell. The change proved a decided advantage. Subsequent calls included the regular posts at which Government or Hudson's Bay Company officials are located, and a trip was also made to Thule, Greenland, where there was an exchange of courtesies with representatives of the Danish Government. Advantage was taken of this opportunity to discuss questions of mutual interest in reference to administration, health of natives, game resources, etc. A small party of Eskimos, men and women, was taken on board at Thule for two years' employment with the Royal Canadian Mounted Police at Craig Harbour.

With the increased number of private commercial radio stations now operating in the Eastern Arctic, and improved equipment used on the patrol vessel combined with other favourable conditions, it was found possible to shorten the previously estimated time of the entire voyage by eleven days. The four and a half days saved at Churchill was attributed mainly to improved facilities available for loading coal. While the vessel was at Chesterfield the Officer in Charge, through the courtesy of the Hudson's Bay Company, was enabled to make an aeroplane flight to Baker Lake where the Royal Canadian Mounted Police are re-opening a post.

The patrol provided the usual opportunity for the Officer in Charge to confer with Government officials, traders, missionaries, and others engaged in various activities in the Eastern Arctic. Observations were made in regard to the general welfare of the natives and the economic conditions affecting their means of livelihood. The medical officer studied health conditions of the natives, and the remaining members of the Government party were afforded opportunities to pursue their investigations and make any observations required.

While at Cape Dorset, southern Baffin Island, arrangements were made for the transportation of several Eskimo families who desired to join relatives at Arctic Bay and Fort Ross.

The supplies carried with the Patrol as Government freight represented about one-third of the general cargo. They included requirements for medical and surgical purposes, food supplies, household equipment, coal, fuel, and lubricating oil. The distribution thereof was as follows: Lake Harbour, 28¼ tons; Eskimo Point, 21¼ tons; Chesterfield, 113¼ tons; Baker Lake, 24 tons; Craig Harbour, 8¼ tons; Pond Inlet, 24¼ tons; Pangnirtung, 87¼ tons; total, 306½ tons.

At Churchill a quantity of green salted buffalo, elk, and moose hides was taken on board for distribution to Eskimos in the Northwest Territories and in northern Quebec.

The temperature during the voyage was much colder than usual although the weather was generally fair. Ice conditions were normal but favourable winds on several occasions kept the vessel's course free from ice.

Public Improvements

Grimshaw-Great Slave Lake Winter Tractor Road.—Under an agreement with the Provincial Government of Alberta a winter tractor road was constructed between Grimshaw, Alberta, and Hay River, Great Slave Lake, N.W.T., a distance of approximately 400 miles. This road may be later extended to Yellowknife via Providence. A tractor train hauling 120 tons of freight left Grimshaw, Alberta, on March 9 and proceeded to Yellowknife, Northwest Territories, a total distance of approximately 580 miles. This distance was covered in 32 days.

Main Road to Waterfront at Fort Smith.—As a result of the landslide which took place in the autumn of 1937 the main road leading to the waterfront at Fort Smith was completely destroyed. A new and more direct road was constructed during the past year.

Fort Smith Waterfront Road.—In order to give access to the seaplane anchorages this road was constructed parallel to Slave River and to connect with the highway leading to the main docks.

Fort Smith Dock.—This dock is used to facilitate the trans-shipment of passengers and freight to and from air and water craft. During the year it was further improved and strengthened.

Yellowknife Townsite Road.—This road was constructed to facilitate transportation within the settlement of Yellowknife.

Yellowknife Bay-Thompson Lake Winter Tractor Road.—A winter tractor road extending from Yellowknife Bay to Thompson Lake, a distance of approximately 30 miles, was constructed by Thompson-Lundmark Gold Mines Limited under an agreement with the Department. This road will serve the mining operations in the general vicinity of Thompson Lake.

Winter Aeroplane Landing Fields and Seaplane Bases.—The following improvements were made during the year:—

The Fort Smith winter field was further cleared and levelled. All buildings in the vicinity of the runways were moved back to facilitate the movement of aircraft.

At Fort Smith seaplane base, 4 floating docks were constructed, and 2 similar docks built previously were anchored in Slave River. The main stationary dock was faced and further strengthened. The shore opposite the floating docks was cleared and levelled and steps installed to provide access from the floating docks to the land level. The floating docks were removed immediately before freeze-up.

The main runway at Resolution winter field was further extended and improved. A second runway at right angles to the first was constructed. Brush was removed and other general improvements carried out.

A wharf 61 feet by 8 feet was constructed at Yellowknife seaplane base and made available for the use of seaplanes. The cabin erected previously was moved to a more accessible location. This cabin was later destroyed by fire.

At Rae seaplane base, the harbour was buoyed and all obstacles marked.

The Providence winter field was further conditioned, fences removed, and other small improvements made.

A floating dock 20 feet by 8 feet was constructed at Simpson seaplane base and anchored parallel to the shore with a sidewalk 20 feet by 4 feet extending from the dock to the shore. This dock was removed in the autumn.

The Wrigley winter field consists of 2 small lakes which have been connected by the removal of trees, mounds and other obstacles. During the year further levelling was done, sunken logs removed, and trees slashed to facilitate the movement of aircraft.

The Norman winter field was found to be in satisfactory condition to meet immediate requirements. The work done during the year consisted of maintaining existing facilities. At the seaplane base, the floating dock constructed previously was launched in the spring and removed in the autumn.

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 due 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 3-year tenure of office. The Controller administers the Government 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 April 25, 1938. This was the first session of the eleventh wholly Elective Council of the Territory. The Council was prorogued on May 2, 1938.

The Game Ordinance was repealed and a new Game Ordinance enacted which is more concise and embodies amendments. Many provisions of the Northwest Game Act have been included and the new Ordinance conforms with the Migratory Birds Convention Act and Regulations. There is a greater measure of control over hunting and trapping, trading and trafficking in fur, and the use of aircraft in trapping operations. Amendments were made to the Sale of Beer Ordinance, Assessment Ordinance, Dental Ordinance, Ordinance respecting Insane Persons, Marriage Ordinance and the Workmen's Compensation Ordinance. A Deserted Wives Maintenance Ordinance was passed.

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 $573,127.47 during the past fiscal year and the revenue collected in the Yukon amounted to $351,410.33. For local purposes the Territorial Government raised $154,134.57, of which amount $95,000 represented the profit from the operation of Government liquor stores.

Lands and Timber

Five sales of land were made and one homestead entry, two agricultural leases, three permits to occupy, two waterfront leases, and four hay permits

were granted. One assignment was registered. There are now in force 23 homestead entries, 8 agricultural leases, 24 waterfront leases, 2 miscellaneous leases, and 15 permits to occupy. The revenue derived from lands amounted to $5,803.07.

One hundred and twenty-three timber permits were issued authorizing the cutting of 671,576 feet board measure of saw timber, 600 lineal feet of timber, and 17,888 cords of wood. Two permits to cut wood for mining purposes were issued free of dues. One licence timber berth was cancelled, leaving 33 in force. Four timber seizures were made. The total revenue collected from timber was $7,480.83.

Mining

A marked increase in placer gold production was noticeable during the past year. Placer mining operations produced 90,509·51 ounces of gold, the total value of which, at $35 per ounce, is $3,167,832.85. This is an increase of 31,969·50 ounces as compared with the previous year, mainly due to the production of Yukon Consolidated Gold Corporation, Limited, which rose from 36,849·65 fine ounces in 1937 to 60,055·76 fine ounces in 1938.

An interesting development in lode mining was the beginning of production in the Freegold Mountain area, Carmacks District, where gold deposits were discovered in 1930.

Production from the mines on Galena Hill in the Mayo District continued steadily and a large tonnage of ore was treated in the mill at the Elsa mine. A number of small operators also shipped silver-lead ore from this district.

Entries were granted for 148 placer and 88 quartz mining claims staked and applied for during the year, and 3,216 such claims were renewed for another year. One quartz mining lease was issued, comprising an area of 25·37 acres, making a total of 4,952·74 acres held under lease.

Gold Royalty.—The total amount collected for royalty on gold obtained from placer deposits up to March 31, 1939, was $5,156,593.63 of which amount $33,941.23 was collected during the fiscal year. (For the purpose of calculating royalty, the gold is valued at $15 an ounce, and a rate of 2½ per cent charged pursuant to Section 83 of the Yukon Placer Mining Act.)

Dredging.—Three leases to dredge for minerals in the beds of rivers in the Territory are now in force, comprising a total river stretch of about 14½ miles. The total rental from this source up to March 31, 1939, amounted to $210,058.86. These leases comprise portions of the bed of Klondike River. For the purpose of gold recovery there are 10 dredges engaged in mining in Yukon Territory, all but one of which are being operated by hydro-electric power.

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 seven hydraulic mining locations held under lease, comprising a total area of approximately 18 square miles. Rentals amounting to $203,798.50 have been collected on account of such locations, the amount received during the fiscal year being $2,765.

Placer Mining

The total number of placer claims in good standing at the close of the year was 2,573, most of which are held by the Yukon Consolidated Gold Corporation Limited. Nine dredges were operated by this company during the year, and these produced 60,055·76 fine ounces of gold and 14,411·98 fine ounces of silver. The company employed an average of 423 men, the peak

during the operating season reaching 678, and expended $1,071,000 for salaries, wages, and power. A further sum of $949,183 was expended for equipment, supplies, and freight.

The greater part of the 90,509·51 ounces of gold produced during the year was from the Dawson District, the Mayo District producing 733·35 ounces and the Whitehorse District 730·89 ounces.

Lode Mining

Dawson District.—While entries for only 15 quartz claims staked during the year were granted, development work was conducted on 383 claims previously staked. A 10-ton mill was installed in the Mount Freegold area and by the end of the year a brick weighing 84 ounces of crude gold was produced. This was the initial production of the area and the first gold produced in Yukon from a lode gold property in many years. It is the intention to enlarge the capacity of this mill to 25 tons per day.

Mayo District.—Operations in this area are conducted mainly by the Treadwell Yukon Corporation Limited. The production in silver-lead concentrates from its "Silver King," "Elsa" and "Hector" groups, Galena Hill, was maintained. Operations on these groups produced 60,240 tons of ore, of which 59,090 tons were milled, 5,988·12 tons of concentrates resulting. The total production was 6,747·39 tons, containing 3,061,763 ounces of silver and 4,075,424 pounds of lead. The total tonnage shipped by the corporation yielded 1,064·8 ounces of gold, 2,872,824·7 ounces of silver, and 5,365,686 pounds of lead, having a gross value of $1,533,912.31. The company employed an average of 179 men throughout the year, the largest number employed during the busy season being 235. The average wage was $8.22 per day, the total wages paid amounting to $510,215.72. An expenditure of $616,466.14 was incurred for equipment and supplies. There are 729 quartz claims in good standing in this district, a decrease of nine as compared with the previous year.

Grants and Leases

Prospecting Leases.—Prospecting leases representing a total of 98 miles were issued during the year on the following watercourses: All Gold, Haggart, Geary, Moose, Duncan, Clear, Ruby, Canadian, Left Fork Clear, Bullion, Sixtymile, Selwyn, Black Hills, Sheep, Little Gold, Britannia, Gold Bottom, Hunker, Victoria, Ten Mile, Barker, Big Gold, Highet, Bedrock, Shorty, Eleven Pup, Green Gulch, and Dublin Gulch.

Water Rights.—There are now in force 43 grants to divert water for mining purposes, under the provisions of the Yukon Placer Mining Act, which grants aggregate 15,050 miner's inches.

Coal.—One coal mining lease is in force, comprising an area of 40 acres on the south fork of Coal Creek.

Assay Office

The Assay Office was maintained as usual at Keno by the Territorial Government. A total of 1,282 samples of rock for assay was received from all parts of the Territory, and 1,925 assays or quantitative analyses were made. In addition, numerous qualitative determinations and chemical tests were made in connection with the identification and classification of various rocks and minerals of which no record was kept. The assays made were gold and silver, 1,282; lead, 633; copper, 7; and molybdenum, 3.

Roads and Bridges

Expenditures on the maintenance of the road system out of Territorial funds were $53,378.41, a decrease of $3,120.02 from the previous year. The operations were confined to maintenance of the roads most used. Some new road equipment was purchased, and all working equipment was repaired and kept in good condition.

A special grant of $50,000 was received from the Federal vote for mining roads, and the net expenditure from this grant was $47,789.13. All of this amount was expended on roads. Highway work consisted of the following: Improvements to sections of the Sulphur-Dominion Creek roads, such as ditching, installing culverts, renewing bridges, and surfacing with best gravels available. Completion of the Silver King road in the Mayo District, and repairing road equipment. Construction of a winter truck road from Mayo to Minto on the Yukon River for twenty-six miles on the Mayo end, and twenty miles on the Minto end, which was approximately one-half of the total distance between Mayo and Minto.

Development of Aircraft Landing Facilities

Expenditures on landing fields from Territorial funds were very limited. The landing field at Mayo was improved by removing a ridge at the eastern end of the east and west runway. By an arrangement with the owner of the adjoining farm the Dawson airport runway may be extended in the future. The landing fields at Mayo and Dawson were dragged and rolled during the winter. The White Pass and Yukon Route and the Pacific Alaska Airways attended to this work at the Whitehorse airport at their own expense. There was a very marked increase in aeroplane traffic in the Territory during the year.

General

Agriculture.—The summer season was very favourable and good crops of vegetables and hay were secured. The season was favourable for cutting and curing the hay and grain fodder crops.

Fur and Game.—The net collections made under the Fur Export Tax Ordinance amounted to $10,837.60, a decrease of $34.53 from the previous year's collections. An increase is shown in the number of beaver, marten, muskrat, otter, weasel, coyote, and wolf pelts taken. The most marked decrease was in red and white fox, lynx, and mink. A total of 1,727 coyote pelts and 637 wolf pelts were presented for payment of export tax. Revenue from fees for licences issued under the Game Ordinance amounted to $4,144, a decrease of $546 from the previous year.

Public Welfare.—The general health of the people of the Territory was good. Hospitals were operated at Dawson, Mayo, and Whitehorse, grants for their maintenance being provided by the Yukon Council. The number of hospital days of patients for the year were: Dawson 12,797; Mayo 2,514; Whitehorse 2,577. The number of hospital days for indigents were: Dawson 9,190; Mayo 54; Whitehorse 640.

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 214, which is an increase of 26 over the previous year.

Law and Order.—Law and order has 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 for lands owned or otherwise controlled by the Dominion; it administers Ordnance and Admiralty lands, Dominion owned public lands, and Soldier Settlement lands on which advances have been made; and it has charge of the adjustment of seed grain, fodder, and relief indebtedness. Where lands are disposed of by sale or otherwise, the Land Registry issues the letters patent.

Central Office of Record

The Central Office of Record is a convenient inventory and it is being increasingly used by the different Departments and the general public At the end of the year 3,848 properties had been recorded.

Ordnance and Admiralty Lands

Ordnance and Admiralty lands are those areas in the Maritime Provinces, Quebec, Ontario, and British Columbia, which were at one time, because of their strategic situation, reserved or acquired by purchase or otherwise by the Crown. When no longer required for such purposes they are transferred to the Department to administer. It is the policy of this Division to make these lands revenue producing, wherever possible, by placing them under occupation in the manner to which they are best suited. The work of administration requires investigations, appraisals, surveys, searches of titles, the preparation of plans, leases and reports, and collecting rentals. As a measure of economy the Soldier Settlement of Canada undertakes the field inspection work when one of its officers is in the vicinity. During the year investigations were made at Shelburne and Tufts Cove, in Nova Scotia; Fredericton, Grand Falls, Oromocto, Pomeroy Bridge, St. Andrews, and Saint John, in New Brunswick; Chambly, Chute à Blondeau, Jacques Cartier, Laprairie, Lauzon, Levis, Longueuil, and Sorel, in Quebec; Barbet Point, Burritts Rapids, Chaffeys Locks, Hogs Back, Nepean Township, Navy Island-Niagara River, Owen Sound, Penetanguishene, Prescott, St. Joseph Island, and Turkey Point, in Ontario. Under the provisions of Section 8 of the Railway Belt and Peace River Block Transfer Agreement, an Order in Council, P.C. 75, was passed on January 11, 1939, appointing C. H. Taggart, D.L.S. of the Department of Mines and Resources as representative of the Dominion to determine the location and boundaries of the Ordnance and Admiralty lands in British Columbia, and to act in collaboration with the representative of the Province appointed for that purpose. Progress reports received indicate that the work is well under way.

Surveys.—A resurvey of the Ordnance Reserve, Laprairie, P.Q., was made and a portion of the Longueuil Ordnance Reserve was surveyed.

Investigation of Titles—Title to the Military Reserve at Laprairie, Quebec, has been established. Title to Royal Square, Sorel, P.Q., is being investigated but the work is not yet complete. Titles of certain water lots in Shelburne Harbour, N.S., were investigated and the areas placed under the administration of the Department of Transport.

One property, a portion of the Military Reserve at Levis, P.Q., was transferred to the Department to administer, and four properties were transferred by this Department to the control of other Departments. There were two properties sold and fifty-one leases issued. The revenue amounted to $19,825.42.

Public Lands

Lands of other Departments no longer required for the purpose for which they were obtained are transferred to the Department as Public lands. During the year five parcels were placed under the control of this Department and two areas were transferred to other Departments. Investigations were made at ten different points and five parcels were sold. The revenue amounted to $8,122.90.

Railway Rights of Way and Roads

Information has been furnished on request on railway matters dealt with in the past. Six reservations were made for roads in letters patent issued.

Soldier Settlement Charged Lands

The unpatented lands in the four western provinces against which charges are registered under the Soldier Settlement Act remain vested in the Dominion. There are 305 quarter-sections comprising approximately 48,800 acres thus administered. They are spread over the four provinces as follows: Manitoba, 47 parcels; Saskatchewan, 145 parcels; Alberta, 95 parcels; British Columbia, 18 parcels.

Letters patent for these lands are issued to those entrants who have completed the duties in accordance with the terms of the Dominion Lands Act, and who have paid in full their indebtedness to the Soldier Settlement of Canada. In cases where the entrants have completed their duties, but have not repaid the indebtedness to the Soldier Settlement of Canada, 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. During the fiscal year twenty applications for letters patent were received of which twelve were approved.

Timber and Grazing

Grazing.—During the year 10,695 acres were included in six annual grazing permits on quarantine reserves along the southern boundary of Saskatchewan and Alberta. This was a decrease in acreage of 37,439 acres as compared with last year, accounted for by the Department of Agriculture having taken over the control of grazing in Townships 1, Ranges 28 and 29, West of the 3rd Meridian, in connection with the Prairie Farm Rehabilitation Program. In the summer grazing season of 1938 there were 896 cattle, 338 horses, and 290 sheep grazing on lands covered by annual permits. The revenue, consisting of rent, amounted to $213.90.

Timber.—Within the boundaries of national parks there are 11 timber berths, 2 in Manitoba and 9 in British Columbia, covering a total area of 65·90 square miles. During the year licences in duplicate were prepared for these 11 berths and the revenue collected amounted to $3,761.13.

On the Dominion Government Coal Block near Hosmer, B.C., there are 2 timber berths under permit but no operations were conducted.

One settlers' timber permit was issued on a soldier grant homestead in the Province of British Columbia.

During the year 53 accounts, covering timber permits issued to homesteaders by the Dominion before the transfer of the natural resources, were verified for the western provinces.

Summary of Revenue Collected

Grazing permits, Saskatchewan	$ 204 80
" " Alberta	9 10
Licence Timber Berths in National Parks	
Ground rental	659 00
Interest on ground rental	5 04
Licence fees	22 00
Fireguarding	191 09
Royalty dues	2,884 00
Settlers' timber permit, British Columbia	26 00
Permit Timber Berths in British Columbia	
Permit fees	2 00
Total	$ 4,003 03

Seed Grain, Fodder and Relief Indebtedness

During the fiscal year, the Alberta, Saskatchewan, and Manitoba Adjustment Boards submitted recommendations relating to the adjustment or apportionment of outstanding seed grain, fodder, or relief indebtedness in 725 cases. Their recommendations were ratified by Orders in Council and 400 discharges and releases of liens were issued, resulting in writing off the amount of $49,056.65. There were 2,168 inquiries received from the Provinces for statements of indebtedness outstanding relative to the issue of land grants, and 151 certificates of indebtedness were issued to be attached to title. Gross collections for the fiscal year amounted to $3,860.97.

The following summary shows the financial operations of the year ending March 31, 1939:—

	Principal	Interest	Total
Debits—			
Balance outstanding March 31, 1938	$ 2,842,253 43	$ 3,035,788 15	$ 5,878,041 58
Accrued Interest April 1, 1938, to March 31, 1939		168,348 45	168,348 45
	$ 2,842,253 43	$ 3,204,136 60	$ 6,046,390 03
Credits—			
Net collections, April 1, 1938, to March 31, 1939	$ 2,461 85	$ 1,300 69	$ 3,762 54
Amount written off as loss by Orders in Council (Sec. 2, Chap. 51, 17 George V)	17,700 47	31,356 18	49,056 65
Amount collected and retained by Province of Saskatchewan as commission*		20 33	20 33
	$ 20,162 32	$ 32,677 20	$ 52,839 52
Amount outstanding March 31, 1939	$ 2,822,091 11	$ 3,171,459 40	$ 5,993,550 51

*Clause 18, Natural Resources Agreement with the Province of Saskatchewan.

The situation with regard to this indebtedness may be briefly reviewed. There are outstanding approximately 10,000 accounts due the Federal Government amounting to over $4,600,000. Of these accounts the Dominion is responsible for collecting those registered against lands that were patented at the time of the transfer of the natural resources in 1930, while the Province concerned looks after the collection of those accounts registered against lands not yet patented at the above date. In addition there are approximately 6,000 accounts due jointly on a 50-50 basis to the Federal Government and the various provinces amounting to over $1,300,000. The duty of collecting the latter amounts rests with the Provinces.

In 1927, Parliament passed legislation (Chap. 51-17 Geo. V) giving the Governor in Council power to make regulations to apportion, adjust, release, or discharge such loans as might be considered equitable in the circumstances. As a result of this legislation Boards were appointed and many cases have been considered by them, the decisions either confirming the indebtedness in full, adjusting it downward, or cancelling it completely. In view however of the large number of accounts still outstanding, it has been decided to undertake a survey of 1,000 cases in Saskatchewan to enable an estimate to be made of the amounts collectible. It is hoped that considerable progress will be made with these during next year.

Letters Patent

During the fiscal year there were 46 Letters Patent issued, covering a total area of 5,507 acres, divided, according to provinces, as follows:—

	Patents	Acres
Manitoba	7	831
Saskatchewan	21	3,250
Alberta	10	1,275
Northwest Territories	2	21
Yukon Territory	6	130
	46	5,507

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

—	Special*		Homestead†		Soldier†		Sale		Railway	
	Patent	Acres	Patent	Acres	Patent	Acres	Patent	Acres	Patent	Acres
Manitoba	4	587	2	244	.....	.....	.....	.....	1	.....
Saskatchewan	20	3,089	.....	.....	1	161	.....	.....	.....	.....
Alberta	7	1,114	1	.....	1	160	1	1	.....	.....
Northwest Territories	.....	.....	.....	.....	.....	.....	2	21	.....	.....
Yukon Territory	.....	.....	.....	.....	.....	.....	6	130	.....	.....

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

†Under these headings are included lands entered for by returned soldiers, affected by loans from the Director of Soldier Settlement of Canada, said loans having been repaid in full. Patents were issued direct to the settler.

There were 306 certified copies of Letters Patent issued during the fiscal year.

NATIONAL PARKS BUREAU

The functions of the National Parks Bureau involve the administration of the National Parks Act and Regulations made thereunder by the Governor in Council, the supervision of all activities within the National Parks, the preparation and distribution of information of all types respecting National Parks and wild life, and the preservation, marking, and care of historic and prehistoric sites of national importance. The Bureau also administers the Migratory Birds Convention Act and Regulations. In the maintenance of law and order within the National Parks, the Bureau has the assistance of the Royal Canadian Mounted Police, who also act as wardens under the Migratory Birds Convention Act. Highways and other public works in the National Parks are constructed by the Surveys and Engineering Branch of the Department.

The National Parks system at the close of the fiscal year included nineteen separate units, having a combined area of 12,403 square miles.

National Parks Visitors

Visitors entering National Parks during the fiscal year 1938-9 numbered 954,120, compared with 1,008,690 in 1937-8. This decrease is due principally to the falling off in attendance at Point Pelee National Park. As usual, visitors by motor were in the majority, amounting to over 90 per cent of the total, and comprised 226,117 cars and 904,382 passengers. Estimated passenger rail traffic was 49,738.

Tourist figures by Parks for the fiscal year ended March 31, 1939, compared with returns for the preceding year are given in the following table:—

Visitors to National Parks

National Park	1938-9	1937-8
Banff	192,635	194,435
Buffalo	10,960	9,830
Cape Breton Highlands	20,500*	20,000*
Elk Island	73,056	63,040
Fort Anne	17,050	17,029
Fort Beausejour	15,405*	20,000*
Georgian Bay Islands	6,169*	7,110*
Glacier	1,200*	1,200*
Jasper	19,388	16,083
Kootenay	52,027	64,657
Mount Revelstoke	6,000*	8,271*
Nemiskam	20*	21
Point Pelee	203,180	296,338
Prince Albert	29,727	28,846
Prince Edward Island	10,000*	2,500*
Riding Mountain	124,459	117,253
St. Lawrence Islands	21,150*	22,000*
Waterton Lakes	86,517	59,520
Yoho	64,677	60,557
Total	954,120	1,008,690

*Estimated.

Recreation

Remarkable opportunities for outdoor life and recreation are to be found in the National Parks of Canada. Motoring, riding, hiking, fishing, canoeing, swimming, golf, and tennis are among the many sports which may be enjoyed in summer, and in the winter ski-ing has become increasingly popular in some of the mountain parks.

Bungalow camps have been established by private enterprise. and public camp-grounds have been laid out at convenient places, which offer excellent opportunities for camping. Hundreds of miles of trails have been constructed which lead to points of interest and beauty not accessible by motor road. Supervised outings conducted by trail-riding, hiking, and alpine climbing organizations are also available in some parks.

The open air swimming pools at the Banff Hot Mineral Springs, at Miette Hot Springs in Jasper Park, and at the Radium Hot Springs in Kootenay Park, were well patronized. Supervised bathing was also available at beaches in many of the parks.

Fishing continued to be one of the favourite sports, especially in the western parks, and many good catches were reported throughout the season. Dr. Rawson of Saskatchewan University is carrying on biological surveys. In order to assure good fishing in park waters, the policy of restocking was continued.

Golf courses maintained by the Department in Riding Mountain, Prince Albert, Elk Island, and Waterton Lakes Parks are available to visitors on payment of a reasonable fee. Two new links in Cape Breton Highlands and Prince Edward Island Parks are under construction, and it is expected that nine holes on each course will be in play before the end of next season. In addition courses operated by private enterprise are open to visitors at Banff and Jasper.

Ski-ing has become increasingly popular as a winter sport in Banff. Jasper, and Mount Revelstoke Parks, and the improved facilities now available for the comfort of skiers has helped to attract large crowds to these parks.

Wild Life Conservation

Conservation of native mammals and birds continues to be a policy of the National Parks Bureau, and the sanctuary conditions provided by the National Parks have resulted in gratifying increases in animal and bird life. Bighorn sheep have shown a decided increase in those parks in which they are found, and according to reports of a recent survey carried out for the Department in the mountain parks, all species of game animals appear to be in a satisfactory condition.

To conserve animal species native to the plains of Western Canada, the Department has for some years maintained in Alberta, four wild animal parks. Three of these areas, namely, Buffalo, Elk Island, and Nemiskam are enclosed by fences. The fourth, Wawaskesy, an unfenced area, originally established for the protection of prong-horned antelope, was abolished in June 1938. In recent years antelope have increased to such an extent on the prairies, that it was no longer considered necessary to maintain two reservations for antelope, and efforts to preserve a herd of these animals were centred at Nemiskam. Reports from the animal parks indicate that the herds of buffalo, elk and moose have increased steadily. A reduction of the number of animals in Buffalo and Elk Island Parks was again made by supervised slaughter.

A feature of interest is the colony of white pelicans and double-crested cormorants which nests on an island in Lavallee Lake, Prince Albert National Park. In August, two colonies of beaver, comprising 9 animals, were transferred to Cape Breton Highlands National Park and are reported to be doing well.

The exhibition herds maintained in the animal enclosures at Banff, Prince Albert, and Riding Mountain National Parks continued to be a source of interest to many visitors. Donations of animals made during the year, included one pair of buffalo and one pair of elk from Elk Island Park to the Wellington Zoological Gardens, New Zealand; and one pair of buffalo and one pair of yak from Buffalo Park to the Moose Jaw Wild Animal Park Society, Moose Jaw, Saskatchewan. Mounting specimens donated from Buffalo Park included one male buffalo to the New York Natural History Museum, New York; three elk to the Natural History Museum, Hamburg, Germany; and two male elk heads to the Hudson's Bay Company, for presentation to His Majesty the King.

Following is a census of wild animals in fenced enclosures in the National Parks, as at March 31, 1939:—

Animals in Fenced Areas

Animal	Banff Park Paddock	Buffalo Park	Elk Island Park	Nemiskam Park	Prince Albert Park Paddock	Riding Mountain Park Paddock	Total
Buffalo	10	2,492	995	.....	10	59	3,566
Antelope	.....	.....	.....	100	.....	.....	100
Elk	.....	1,674	473	.....	.....	55	2,202
Hybrids (cattalo)	.....	88	.....	.....	.....	.....	88
Moose	.....	137	99	.....	.....	4	240
Mule deer	.....	842	27	.....	.....	4	873
White-tailed deer	.....	.....	.....	.....	.....	5	5
Yak	.....	36	.....	.....	.....	.....	36
Rocky Mountain Sheep	4	.....	.....	.....	.....	.....	4
	14	5,269	1,594	100	10	127	7,114

Forest Fire Control

The fire season of 1938 has been, on the whole, a very favourable one for the National Parks. In the western parks with the exception of Riding Mountain, no fires of any consequence occurred, and in the eastern parks only one small spot fire was reported. This satisfactory condition is largely attributable to favourable weather conditions, to better co-operation from the public, and improved methods of detection and suppression of fires.

The total number of fires during 1938 was 51 and the total area burned 2,864 acres, as compared with a total of 79 fires and 21,886 acres burned in 1937. The distribution of fires during 1938 was very similar to that which occurred in 1937, with 24 out of the total of 51 occurring in Riding Mountain and Prince Albert Parks, and burning over 2,847 acres. Fortunately the loss of valuable timber was again small, a large part of the burned area consisting of grassland and old burn.

Regular aeroplane patrols were carried out in Riding Mountain and Prince Albert Parks, and rendered valuable assistance in the detection and control of fires.

During the year considerable progress was made in the fire protection organization by the addition of new equipment and the adoption of improved methods of fire detection and suppression. In Riding Mountain and Prince Albert National Parks, the existing fire protection system was augmented by the erection of a series of steel and wooden lookout towers for fire detection purposes. The primary towers in this system were all linked up with the existing telephone system, so that tower observers were in direct communication with park headquarters. In addition, with a view to facilitating the transportation of men and equipment in case of fire, a considerable amount of work was done on construction and improvement of trails. The Department now has under consideration the establishment of fire weather recording stations in Prince Albert and Riding Mountain National Parks, and a fire hazard research station in the vicinity of Banff Park. Considerable work towards the establishment of these stations has already been undertaken.

Following is a summary of fires for the fiscal year 1938-9, indicating the number of fires, area burned, and cost of extinguishing:—

General Fires

Region	Fires	Area Burned	Cost of Extinguishing
	Number	Acres	$ cts.
Banff National Park	16	17	1,282 94
Jasper National Park	3	Spot	29 00
Elk Island National Park	1	"	.....
Prince Albert National Park	8	67	460 45
Riding Mountain National Park	16	2,780	3,226 65
St. Lawrence Islands National Park	1	Spot	6 30
Yoho National Park	3	"	2 38
Total	48	2,864	5,007 72

Railway Fires

Banff National Park	3	Spot	.....
	3	.....	.....
Grand Total	51	2,864	5,007 72

Park Roads, Trails, and Telephone Lines

Construction of all-weather motor highways and secondary roads, trails, and telephone lines was continued in the National Parks during the year. New construction on the Banff-Jasper Highway was approximately 15 miles. A full description of the work undertaken will be found in the sections dealing with the individual parks.

The mileage of roads, trails, and telephone lines within the National Parks of Canada on March 31, 1939, is detailed in the following table:—

Means of Travel and Communication

Region	Roads			Trails	Telephone Lines
	Motor	Secondary	Total		
	miles	miles	miles	miles	miles
Banff National Park (including Banff section of Banff-Jasper Highway)	162·60	19·00	181·60	900·00	226·00
Buffalo National Park	2·00	25·00	27·00	57·00	36·00
Cape Breton Highlands National Park	10·50	46·50	57·00	10·05	.....
Elk Island National Park	16·00	2·00	18·00	3·75	16·00
Glacier National Park	.....	12·00	12·00	109·00	3·25
Jasper National Park (including Jasper section of Banff-Jasper Highway)	141·50	10·00	151·50	624·00	340·50
Kootenay National Park	61·10	11·00	72·10	126·00	62·00
Mount Revelstoke National Park	19·00	.....	19·00	45·00	17·00
Point Pelee National Park	9·00	1·50	10·50	.....	6·00
Prince Albert National Park	63·00	75·80	138·80	390·00	151·00
Riding Mountain National Park	50·20	54·00	104·20	113·00	196·00
Waterton Lakes National Park	44·45	3·00	47·45	240·00	58·00
Yoho National Park	44·50	6·00	50·50	192·50	56·00
Prince Edward Island National Park	3·00	.....	3·00	.....	.....
Totals	626·85	265·80	892·65	2,810·30	1,167·75

Engineering

Engineering work carried out in the National Parks during the year included the maintenance and operation of public services, such as electric lighting, telephones, water supply, and sewage systems; the construction and maintenance of highways, bridges, and buildings in the parks and at historic sites; and the maintenance of streets and sidewalks, disposal of refuse, and mosquito control in park townsites.

A description of the engineering work carried out in the National Parks during the year will be found in the sections dealing with the individual parks, and in the report of the Director of the Surveys and Engineering Branch.

Unemployment Relief

Unemployment relief work, which has been carried on in National Parks since 1930, was again provided during April and May, 1938, and January, February, and March, 1939, for permanent park residents with domestic responsibilities who proved that they were needy.

In Banff National Park, 4,401 man-days of work were provided for 123 individuals having 309 dependents, making a total of 432 park residents assisted. In Jasper National Park, 1,389 man-days of work were provided for 33 individuals having 79 dependents, making a total of 112 park residents assisted.

Activities carried out for the relief of unemployment included collecting fuelwood for camp-grounds and government buildings, clearing and burning brush for mosquito control, improvement and maintenance of roads, removing snow from townsite streets, and thinnings and sanitation cuttings.

Revenue

Receipts from public utilities and other sources of direct revenue in the National Parks of Canada, including administration of the Migratory Birds Convention Act, amounted to $366,223.97 for the fiscal year 1938-9, as compared with $325,674.12 for the fiscal year 1937-8, an increase of $40,549.85.

A statement of revenue by parks, etc., follows:—

National Park	*Revenue*
Banff	$ 153,339 77
Buffalo	32,578 16
Cape Breton Highlands	239 86
Elk Island	20,012 42
Fort Anne	90 00
Georgian Bay Islands	119 00
Glacier	118 55
Jasper	51,010 16
Kootenay	17,607 18
Point Pelee	6,615 10
Prince Albert	13,576 89
Prince Edward Island	117 35
Riding Mountain	43,820 16
St. Lawrence Islands	200 00
Waterton Lakes	16,860 67
Wawaskesy	40 00
Yoho	4,240 80
Mount Revelstoke	1 00
Historic Sites	391 20
Head Office	11 29
	360,989 56
Less refunds	665 27
	360,324 29
Fines and forfeitures	$ 1,190 71
Casual revenue	3,856 39
Migratory Birds Convention Act	850 03
Premium and Exchange	2 55
	5,889 68
	$ 366,223 97

Publicity and Information

During the year the Publicity and Information Division was active in the promotion of tourist travel to the National Parks, and in directing attention to the scenic, recreational, and educational advantages of these great national possessions. This was accomplished by the preparation and careful distribution of press articles, illustrated descriptive literature, maps, and photographs; by lending motion picture films, lantern slides, line-cuts, and half-tones; by radio talks and addresses; by participation in exhibitions, and by correspondence. Close contact was maintained with organizations associated with the promotion of tourist travel, including the Canadian Travel Bureau, which were supplied with timely press articles, photographs, and literature. Through the release of press articles and by other media special efforts were made to attract visitors from the British Isles and the United States.

A total of 115 articles descriptive of the attractions of the National Parks and Historic Sites of Canada was given a wide distribution to leading newspapers, magazines, and other publications. More than 200 short articles were circulated by means of the Canadian Resources Bulletin. By special arrangement with the Commissioner of Emigration, London, England, articles and photographs featuring the National Parks were published in newspapers of the British Isles.

To meet the ever increasing demand for printed literature descriptive of the National Parks and Historic Sites, 381,870 copies of publications were printed and delivered during the year. Included was an attractive new pamphlet, printed in two colours, descriptive of Jasper National Park, Alberta. A complete list of publications issued follows:—

Annual Report, National Parks Bureau (contained in the separate report of the Director, Lands, Parks and Forests Branch)	500
Banff National Park, General Information, (Folder)	25,000
Canada's Maritime Playgrounds (Descriptive Booklet)	25,750
Canada's Mountain Playgrounds (Descriptive Booklet)	100,000
Catalogue of National Parks Motion Picture Films (Third Edition)	1,000
Fort Chambly, Guide to (English Edition)	5,750
Fort Chambly, Guide du (French Edition)	10,000
Fort Lennox, Guide du (French Edition)	10,000
Jasper National Park, General Information (Folder)	25,000
Jasper National Park (Descriptive Booklet)	50,000
Kootenay, Yoho, Glacier, and Mount Revelstoke National Parks, General Information (Folder)	25,000
National Historic Sites (Reprint from Canada Year Book) (English Edition)	2,000
Sites Historique du Canada (Reprint from Canada Year Book) (French Edition)	1,000
National Parks of Canada, The (Descriptive Booklet) (Second and Third editions)	75,420
Riding Mountain National Park (Descriptive Booklet)	25,450

Numerous requests for educational and descriptive material were received from tourist agencies, travel companies, boards of trade, automobile associations, and similar organizations, as well as from individuals, which were met with a total distribution of 21,079 copies of Immigration literature, and 359,646 copies of Parks literature, in addition to approximately 10,500 copies of maps and other pamphlets.

Wide circulation of National Parks motion films was continued during the year. The library now contains 84 subjects in 35-mm. size and 87 in 16-mm. size, comprising a total of 1,817 prints descriptive of the scenic, recreational, and wild life aspects of Canada. During the year, 4,700 feet of new kodachrome colour film, 7,132 feet of new 35-mm. negative film, and 122,199 feet of positive film were purchased. The above included 315 prints. A total of 30 worn out prints of various sizes were discarded.

New film subjects produced and released during the year included the following: *Playground Sanctuary; Where Cohoes Play.* Film subjects which were re-edited during the year included: *Pilgrims of the Wild; Strange Doings in Beaverland; The Beaver Family.* Five other film subjects were produced for other branches of the Department.

The continued demand for National Parks films during the fiscal year is indicated by the following comparative figures: 1935-6—3,293; 1936-7—3,884; 1937-8—4,026; 1938-9—3,980. Prints were circulated in the United States, Great Britain, Australia, South Africa, Roumania, Norway, Alaska, and New Zealand, as well as in different parts of Canada. The estimated attendance at showings of National Parks films during the year was 2,540,000.

Additions to the photographic library included 413 negatives of various sizes, and 13,439 photographic prints and enlargements. A total of 8,479 photographs and enlargements were distributed for publicity purposes. A total of 517 half-tones, line-cuts, and stereotypes were lent during the year to editors, publishers, and writers.

The lantern slide library, which contains several thousand subjects depicting the scenery, fauna, and flora of the National Parks, also experienced a steady demand for this type of visual educational material. During the year 4,662 slides, accompanied by lecture notes, were lent and the library stock was augmented by 1,284 new slides. Following a survey of the slide library, a large number of slides were retouched and remounted. A total of 42 photographic enlargements and 51 translites were coloured during the year.

The Superintendent of Publicity and Information delivered a number of addresses in different parts of Canada.

The National Parks Bureau was represented by an attractive exhibit in the Railway Building at the Canadian National Exhibition, Toronto. The exhibit occupied a space of more than 3,000 square feet, and embraced mounted specimens of wild animal and bird life native to the National Parks, photographs, oil paintings, and coloured translites in electrically illuminated cases. The exhibit was awarded a gold medal by the Exhibition Association. Photographs, translites, and mounted wild life specimens were also shown during the year at the following exhibitions: The Empire Exhibition, Glasgow, Scotland; Greater North Dakota Tourist Association, Fargo, North Dakota; American and Canadian Sportsmen's Show, Cleveland, Ohio; Pacific Northwest Tourist Association; Peace Exhibition Contest held at Provincial Exhibition, Regina, Saskatchewan; Canadian Wilderness Exhibition held in connection with the New England Sportsmen's Shows at Boston, New York, Indianapolis, and Detroit; and the International Travel Exposition, Chicago, Illinois.

NATIONAL PARKS OF CANADA

As the term "National Park" in Canada is used to cover a variety of reservations, the National Parks may be divided, for purposes of comparison, into three main classes. These include: the scenic and recreational parks, situated in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, and Prince Edward Island; the wild animal parks or reserves, situated in Alberta; and the national historic parks, situated in Nova Scotia and New Brunswick.

Scenic and Recreational Parks

Banff National Park

This mountain playground, with its many ice-fields and glaciers, is typical of the central Rockies. The park has an area of 2,585 square miles, and located therein are the world famous resorts of Banff, with its hot mineral springs, and Lake Louise. Motor highways in the park have a total length of 162·6 miles and secondary roads 19 miles in addition to which there are 900 miles of trails and numerous motor camp-grounds. The park is a big game sanctuary and a year round sports centre; recreations include motoring, riding, climbing, hiking, golf, tennis, boating, swimming, skiing, skating, and curling.

During the past year visitors to Banff Park showed a slight decrease from the previous year. Banff, Kootenay, and Yoho Parks being linked together by standard highways, it is necessary when compiling tourist traffic to give due consideration to traffic originating in these areas.

Following is a table showing the total number of visitors, how these figures are made up, and comparative figures for the previous year.

Visitors to Banff National Park

Route	Motor Vehicles		Passengers	
	1938–9	1937–8	1938–9	1937–8
Westbound—				
Via Banff Park (Eastern Gateway Entrance)	44,125	44,192	142,155	148,981
Eastbound—				
Via Kootenay Park (Radium Hot Springs entrance—75% eastbound traffic)	5,466	6,593	16,573	20,773
Via Yoho Park (Leanchoil entrance, 66⅔% eastbound traffic)	1,260	1,562	3,907	4,681
Tourists for Banff Park by rail—east and west (estimated)	.....	.....	30,000	20,000
Totals	50,851	52,347	192,635	194,435

The Information Bureau opened on May 15 and closed on September 30, during which period 29,809 inquiries of all descriptions were dealt with.

Licences and permits issued during the year totalled 19,426 compared with 20,209 during the previous year. In addition 328 building permits having an estimated property value of $88,485 were issued. The great increase in the number of building permits was due to the large number of improvements to existing cabins.

Health conditions during the year were generally good. Milk and water supplies were regularly tested, and constant supervision maintained over all matters relating to public health.

A total of 38,285 persons passed through the turn-stile at the Cave and Basin bath-house, as compared with 40,144 last year. The total number of people making use of the Upper Hot Springs bath-house was 46,840 as compared with 42,338 last year.

The public camp-grounds continued to be popular, and although a considerable decrease was noted in the number of campers, the length of stay was increased. Registration at the Tunnel Mountain camp-ground was 2,341 cars and 8,871 campers, a decrease of 8,652 persons from last year. The number of person-days spent in camp was 22,308 or an average of 2·51 days per person. Improvements included planting of some 200 spruce and balsam trees, at Tunnel Mountain. At Banff bungalow camp 43 cabins were in operation from May 5 to October 6, and at the camp on the Trans-Canada Highway east of Banff 12 cabins were open from July 4 to October 6. All bungalow camps in the park were well patronized throughout the season. Sites were chosen for camp-grounds at Bow Summit and near the Waterfowl Lakes, and for three new picnic grounds, eleven miles east of Banff at Hillside and at Baker Creek.

New construction was confined to a new two-room cabin at Healy Creek, one section being for the use of the warden and the other as an emergency shelter for trail riders, hikers, and skiers. In addition the following improvements were undertaken: five cabins were reroofed, three houses and two cabins were painted, material from the abandoned relief camp on Spray River was moved to Mount Norquay Ski Camp for use as a shelter; a new stove, benches and table were placed at the picnic grounds at Massive and Baker Creek.

New construction was confined to 9 miles on the Banff end of the Banff-Jasper Highway, which brings the total mileage constructed to 45·84 miles, and leaves 23·8 miles still to be done. Hard surfacing of the Trans-Canada Highway was completed from the east boundary to Mile 9 west of Banff. All main and secondary roads were maintained in good condition and oil-treated where conditions warranted. Nine miles of fire-road were constructed towards Ptarmigan Lake and 4 miles along Healy Creek, and 2 miles were cleared along Goat Creek. In addition, 30 miles of existing fire-roads were graded. The bridge over the Bow River at Massive was rebuilt and three new rustic bridges were constructed in Johnson Canyon. Three miles of revision were carried out on the Ptarmigan trail and 900 miles of existing trails maintained.

Six miles of new telephone line were constructed and 5 miles revised along the Trans-Canada Highway west of Banff. All existing lines were maintained in good order.

During the season a total of 19 fires occurred. All of these fires were confined to small areas, burning over a total of approximately 18 acres consisting mostly of grassland.

The park museum was open from March 1 to October 31, and attracted a total of 17,212 visitors.

Reports from all districts indicate that wild animals are in good condition, with noticeable increases in elk, moose, and wolverine. Predators are scarce. With the exception of grouse, in which there was a noticeable increase, bird life is scarce. The animal paddock now contains 10 buffalo, and 4 Rocky

Mountain sheep, all of which proved a great attraction to visitors. Fishing in park waters was generally good in the lakes, but rather poor in the streams. Distribution of fish from the Banff hatchery during the past year was as follows: In park waters: speckled trout, 105,000, rainbow trout 472,000; in provincial waters: speckled trout 590,000, cut-throat trout 349,000. Total 1,516,000.

In co-operation with the Forest Service some valuable work was undertaken in the control of mistletoe blight by segregating and removing infected trees. Periodic collections of forest insects were again made for the Dominion Department of Agriculture and forwarded to their laboratory at Kamloops, B.C. Some 200 small trees were planted at Tunnel Mountain camp-ground.

On February 5 the Calgary-Edmonton Inter-City Ski Meet was held on Mount Norquay and on February 19 the Alberta Provincial Championships were run off. The Banff Winter Carnival was held from February 16 to 19 and was one of the most successful carnivals ever held in the park.

The annual Indian Days Sports were held in Banff from July 20 to 24 and were attended by some 587 Indians. The Trail Riders of the Canadian Rockies held their annual ride from July 29 to August 2 with 43 trail-riders taking part in the ride.

Early in August a party of English and New Zealand school boys visited the park, under the auspices of the British Empire Council of Education and spent about a week under canvas at the Tunnel Mountain camp-ground. The success of this camp has resulted in a movement toward the establishment of a student centre in Banff National Park which could be used by students from all parts of the British Empire.

Cape Breton Highlands National Park

Cape Breton Highlands National Park is a typical example of the rugged coastline of Cape Breton Island. Its mountain background and remarkable seascape are visible from the motor road that girdles the park. The park was established in 1936, and has an area of 390 square miles.

The park is traversed on the north by a motor road well known as the Cabot Trail, which connects with Nova Scotia's main highway system. Entrance may be made over an eastern route leading by way of Baddeck and North River or by way of Sydney through the famous Bras d'Or Lake region to Ingonish, and over a western route by way of the well known Margaree Valley to Cheticamp.

During the past year, facilities were not available for accurately checking the number of visitors. However from the registrations at the local hotels, it was estimated that approximately 20,500 persons visited the park during the year. This is about the same as the previous year.

Construction of new buildings included a residence for the Superintendent, and an administration building. Work has progressed favourably on these buildings, both of which are still under construction. Grading was completed for the entrance gate at Ingonish, and for the new tennis courts. The area surrounding the bath-house sites was cleared and graded, a sand beach constructed on the freshwater lake, and plank walks laid across the barrachois, separating the freshwater lake and the sea. The athletic field and parking ground have been levelled and graded. All wooded areas surrounding the bath-house, tennis courts, and athletic field have been underbrushed and cleared.

Work on park roads included general maintenance, rebuilding of culverts, redecking bridges, widening curves and opening up drains. New construction included 9 miles of highway completed, 1½ miles 75 per cent completed, and 2 new bridges and 2 trestles completed. In addition the road right-of-way from the administration building to the athletic field was cleared and grubbed. All park trails were maintained in good condition.

The radio telephone system worked very satisfactorily throughout the entire season. Two sets are in operation in the park, one 15-watt set at Ingonish and one 5-watt set at Cheticamp.

No forest fires were reported within the park. Several fires occurred outside the park, but were placed under control by park officers before they reached the boundary.

Wild life within the park is reported to be increasing, with white-tailed deer and snowshoe rabbit the most numerous. A few black bear and red fox have been seen, and there is evidence of a considerable number of lynx. The two colonies of beaver, which were placed in the park in August, have built two dams on Roper's Brook and appear to be doing very well. Ruffed grouse are plentiful.

Fishing in park waters was very good, with some good catches of salmon reported from Cheticamp River, and trout from Warren Lake. During the year 180,000 salmon fingerlings from the hatchery at Margaree, were distributed in Cheticamp River.

Early in August work was started on the construction of a golf course, and very favourable progress was made until November, when work was suspended for the season. At the time work was discontinued the first 9 holes were practically ready for seeding, and a start had also been made on the 5th, 6th, 7th, and 8th holes of the second half.

Georgian Bay Islands National Park

The park includes thirty islands in the Georgian Bay Archipelago, many of which provide recreational opportunities for camping, fishing, boating, and bathing. The park was established in 1929 and has an area of 5·37 square miles. Beausoleil Island, north of Midland and Penetanguishene, is the largest of the island group, and on it are located the park headquarters, camp sites, and other tourist attractions.

It is estimated that during the past year, 6,169 persons visited Beausoleil and Flowerpot Islands, as compared with 7,110 during the corresponding period last year.

Improvements carried out on Beausoleil Island included the construction of a new dock at Cardinal Cove, addition to main dock at park headquarters to accommodate small boats, construction of stove with shelter near Little Dog Channel, roof over stove at Shore Dining Point, and a flagstone walk 125 yards long from the the beach to the dock at Rockview Beach. In addition the Lions Club of Toronto erected a recreation building, staff sleeping quarters, ice house, hospital, and open air council chamber at Cardinal Cove. A new dock was constructed at Seiners Point on Island No. 92.

During the summer a geological survey of Flowerpot Island was carried out by an officer of the Mines and Geology Branch of the Department.

An increase has been noted in the number of elk, and a small decrease in the number of white-tailed deer. Red fox and black squirrel are plentiful, and groundhog and rabbit are quite scarce. Bird life appears to be increasing and includes many varieties of land, shore, and water birds. Increases were particularly noted among swallows, hummingbirds, and ruffed grouse. Throughout the season patrols to the various islands were made by the park warden.

Glacier National Park

This park with its snow-capped peaks, immense ice-fields, luxuriant forests, alpine flora, and subterranean caves, is typical of the Selkirk Mountain region. Secondary highways extend for 12 miles, in addition to which there are 109 miles of trails. The park was established in 1886 and has an area of 521 square miles.

Although Glacier National Park is not accessible by motor highway, it is a popular centre for alpine climbing, and during the year attracted an estimated total of 1,200 visitors. Some 90 members of the Mountaineers of Seattle, Washington, U.S.A., spent their annual outing in the park.

No new construction was undertaken during the year, work being limited to maintenance of cabins, trails, telephone lines, and the Nakimu Caves road. In co-operation with the Dominion Department of Agriculture, specimens of insects were collected.

No forest fires occurred within the park, although there were periods of high hazard. This favourable record is probably due to some extent to the lack of severe electrical storms which are one of the main causes of fires in this park.

All wild life is reported to be in good condition and thriving. Caribou have been seen in large herds and mule deer and Rocky Mountain goat are plentiful. The smaller fur-bearing animals are also numerous. Predators are scarce. Fishing in park waters was good.

Jasper National Park

This mountain wilderness on the eastern slope of the Rockies is rich in historical associations, and contains many majestic peaks, alpine valleys, glaciers, canyons, and beautifully coloured lakes. Outstanding points of interest include Mount Edith Cavell, Maligne Lake, Tonquin Valley, Miette Hot Springs, Sunwapta Falls, Athabaska Glacier, and the Columbia Ice-field. The park is a big game sanctuary and alpine playground. Motor highways extend for 141 miles through the park, secondary roads for 10 miles, and trails cover 624 miles. The park was established in 1907 and has an area of 4,200 square miles.

A gratifying increase in the volume of tourist travel was again recorded. The following table gives the number of visitors during the past two years.

Visitors to Jasper National Park

Mode of Travel	Motor Vehicles		Passengers	
	1938–9	1937–8	1938–9	1937–8
By Motor Vehicles—				
Canadian	2,158	1,331	7,299	4,276
United States and foreign	168	122	551	376
By Rail	.....	.....	11,538	11,431
Total	2,326	1,453	19,388	16,083

The Information Bureau dealt with a total of 942 inquiries, an increase of 66 as compared with the previous year.

Licences and permits issued during the year totalled 3,549 as follows: chauffeur licences, 116; guide licences, 38; dog licences, 63; business licences, 75; camping permits, 590; building permits, 48; timber permits, 85; automobile licences (yearly), 312; automobile licences (transient), 1,740; provincial drivers' licences, 302; and miscellaneous, 180. This represents an increase of 1,304 over the corresponding period last year.

The bath-house at Miette Hot Springs was officially opened to the public on June 14, and proved a source of great attraction. During the season a total of 11,065 persons made use of the facilities provided. These bathers were made up as follows: swimming pool, 8,767, and plunge rooms, 2,298. Improvements carried out during the year included installation of two fans to ventilate the plunge bath rooms; a steel door fitted to control room; a steel sash with Murnese lights installed in the walls of the steam rooms; a chain link wire fence enclosing an area for stores in the basement, and two outside lights to light the entrance steps and parking area.

Four automobile camp-grounds, situated at Patricia Lake, Cottonwood Creek, Miette Hot Springs, and Medicine Lake, were open to the public throughout the season. Registrations at these points were as follows: Patricia Lake, 142 cars and 539 campers; Cottonwood Creek, 179 cars and 683 campers; Miette Hot Springs, 140 cars and 732 campers; Medicine Lake, 52 cars and 150 campers; combined total, 513 cars and 2,059 campers. The average stay per person was 5 days as compared with 4·57 last year.

Improvements carried out during the year included extension of the electric light system from Jasper townsite to Cottonwood Creek auto camp; and completion of open air kitchens, caretakers' cottages, and construction of sewage disposal system and streets at Miette Hot Springs auto camp.

All Government buildings were maintained and new construction included three shelter cabins, in Blue Creek Valley, on Mowitch Creek, and below Emperor Falls Hill.

All park roads were maintained in good condition, and road oil was applied on some sections. Improvements were carried out during the year on the Maligne Canyon, Mount Edith Cavell, Pyramid Lake, Jasper-Edmonton, and Pocahontas-Miette Hot Springs roads. Construction of the Banff-Jasper Highway was advanced to Mile 79·5 in Banff Park, approximately 6·5 miles having been completed during the year. The highway was open to the public as far as the Athabaska Glacier, Mile 66 from Jasper.

Work on trails during the year was confined to general maintenance, and minor improvements to the Miette, Snake Indian, Pyramid Lake and Meadow Creek trails. Other trails were brushed out by the wardens in their respective districts.

All park telephone lines were reconditioned and maintained in good order. This work included resetting 9 miles of poles along the road between Jasper and Geikie, and 2 miles of line was relocated along Medicine Lake. The automatic telephone system in the townsite performed satisfactorily throughout the season. This service, which was first opened for public use in September, 1937, now has 23 paying subscribers.

Favourable weather conditions prevented any serious fire-hazard. During the year 3 small forest fires occurred, all of which were extinguished at a small cost without causing any damage. In addition 4 fires occurred within the townsite, all of which were extinguished before any serious damage was done.

All streets and sidewalks in Jasper townsite were maintained in good condition. Connaught Drive and Pyramid and Miette Avenues were improved. A parking space was constructed immediately to the rear of the administration building and approximately 3,000 plants set out in the grounds.

On the water system, the concrete retaining wall at the Cabin Creek dam was repaired, the bed of the stream leading into Cabin Lake was cleared over a distance of 1,410 yards, and one new 6-inch hydrant was installed at the south end of Block 7, making a total of 22 hydrants for the town. There are now 332 premises connected to the permanent water system. The electric light and power service was maintained to all connected buildings and street lights. The total number of connections to domestic, business, and Government premises was 376 at the end of March.

An intensive campaign was waged against mosquitoes in Jasper townsite and vicinity, with the gratifying result that very few mosquitoes were seen in the townsite or at Jasper Park Lodge.

According to reports all wild life in the park would appear to be in good condition. Elk, moose, caribou, Rocky Mountain sheep, and goat are plentiful. Elk have made the most noticeable increase, and according to reports are spreading outside of the park boundary. Mule deer and black bear are the only species that show any definite decrease in numbers. Grizzly bear are quite plentiful in most districts. Among the smaller fur-bearing animals.

beaver, marten, mink, weasel, and wolverine are plentiful, and a few families of otter have been seen in the Athabaska Valley and in the vicinity of the Valley of the Five Lakes. Predators have been more plentiful than usual, and the total number destroyed during the year included 63 coyotes, 23 cougars, and 4 wolves.

Museum specimens collected included one Rocky Mountain ram for the National Museum of Canada, and one male caribou for the Royal Ontario Museum of Zoology.

Fishing in Jasper Park waters continued to be good, and some excellent catches of trout were reported. The total number of permits issued for the Maligne-Medicine Lake area was 1,140, an increase of 13 over the previous season. The total number of fish taken was 8,248, or an average of 7·23 per permit. As compared with last year there was a decrease of 531 in the number of fish taken in the Maligne area, but the total weight increased by 134 pounds, indicating an average weight of 11·12 ounces as against 10·2 ounces last year.

In accordance with recommendations made by the Biological Board of Canada, stocking was continued, and during the season 451,333 rainbow trout fry from the Jasper Hatchery were distributed in park waters. Among the lakes and streams restocked during the year were the following: Dorothy, 40,000; Horseshoe, 20,000; Geraldine, 20,000; Pyramid, 116,333; Valley of the Five Lakes, 45,000; Lake Annette, 50,000; Adolphus, 10,000; Patricia, 60,000; Lake Edith, 70,000; Topaz, 10,000; and Blue Creek, 10,000. The latter two are waters not previously stocked.

Throughout the season the warden service co-operated with the Division of Entomology of the Department of Agriculture in the 1938 Forest Insect Survey. Specimens were collected periodically and forwarded to the Division of Entomology for identification. According to reports only the native species of saw-fly was found in the park. Approximately forty acres of land on the Maligne horse range was seeded to crested wheat grass.

Many opportunities for varied forms of recreation are found in Jasper Park, and full advantage was taken by visitors of the facilities available for golf, riding, fishing, hiking, tennis, climbing, and motoring in the summer and ski-ing in the winter. Ski-ing has become increasingly popular, and during the past winter the Jasper Ski Club held two successful meets in which contestants from Blue River, Edson, and Jasper took part. This club now has a total membership of 170 as compared with 37 last year. Development of a ski-ing area on the north slope of Whistler Mountain has made considerable progress during the year as follows: clearing and improving of slalom course, 2,000 feet; construction of a trail 20 feet wide for 2,670 yards to connect the slalom course and the Alplands ski camps, and a trail 12 feet wide and 700 yards long connecting the main ski run with the horse trail.

Kootenay National Park

This mountain park is on the western slope of the Rockies and encloses the Vermilion-Sinclair section of the Banff-Windermere Highway. It has many deep canyons, beautiful valleys, and hot mineral springs. Motor camp-grounds are provided, and recreations include bathing, riding, hiking, and motoring. Motor highways extend for 61 miles and secondary roads for 11 miles in addition to which there are 126 miles of trails. The park was established in 1920 and has an area of 587 square miles.

Tourist traffic showed a decrease from the previous year. A total of 15,295 motor vehicles and 52,027 persons entered the park, as compared with 20,205 motor vehicles and 64,657 persons last year. The decrease in traffic during the current year is doubtless due to some extent to the condition of the Columbia Valley Provincial highway, south to the International Boundary, which is being prepared for hard surfacing.

Following is a table giving a comparison of 1938-9 travel figures with those for the previous season:—

Visitors to Kootenay Park

Route	Motor Vehicles		Passengers	
	1938–9	1937–8	1938–9	1937–8
Eastbound—				
Via Radium Hot Springs	7,289	8,791	22,098	27,698
Westbound—				
Via Radium Hot Springs (estimated)	5,800	9,205	23,203	29,510
Via Vermilion Pass (estimated)	2,206	2,209	6,726	7,449
Totals	15,295	20,205	52,027	64,657

During the summer periodic inspections were made of all camps and public services, and constant supervision was maintained over all matters affecting public health.

A total of 24,147 persons made use of the bathing facilities at Radium Hot Springs, as compared with 25,856 during the previous year, a decrease of 1,709 persons.

The camp-grounds throughout the park again proved popular, but a marked decrease was noted in the number of campers. As usual the Radium Hot Springs (Red Rock) camp-ground attracted the greatest number of visitors, with a total registration of 1,376 persons. The average stay per person was 1.51 days, or a total of 2,078 person-days.

At Radium Hot Springs improvements at the bath-house included replacement of steps and diving board, repainting and rewiring of entire building. At the wash-house a new floor was laid, a concrete base constructed for the boiler, and a new electric washing machine purchased. In addition a new rock retaining wall was built above the pool and a wire fence erected.

The archway buildings at headquarters were treated, painted and calsomined; a new kitchen shelter was built at Dolly Varden camp-ground; a new warden's cabin was constructed near the headwaters of Tumbling Creek; a new roof and several windows were added to the patrol cabin at Snow Creek, and the cellars at Kays and Marble Canyon cabins were re-timbered and some painting done.

The Banff-Windermere Highway which is the main artery of travel through the park, was opened for traffic on May 21. This road was maintained in good condition throughout the season. One new bridge was constructed to replace the old one leading from the highway to Marble Creek camp-ground.

Considerable improvement work was carried out on park trails, all of which were cleared out and put into good condition. The Ochre Creek trail in particular was practically re-built, and is now an important link in the fire protection system of the park. All telephone lines were maintained in good condition.

No forest fires occurred during the year, although the latter half of July and the whole of August was dry and hot, with hazard conditions high. Investigation of forest insects was again carried on by the Dominion Department of Agriculture assisted by the warden service. Reports indicate that the spread of the bark-beetle infestation near McLeod Meadows has been controlled and the beetle is rapidly being exterminated.

Wild life is reported to be thriving and in a healthy condition. Among the big game animals, moose, elk, sheep, and mule deer appear to be increasing, white-tailed deer remain unchanged, and bear are less plentiful than usual

The smaller fur-bearers appear to be increasing, with the exception of snowshoe rabbit which are normal and coyotes which are scarce. The number of willow (ruffed), blue, and Franklin grouse remain unchanged.

The tennis courts at Radium Hot Springs were very popular, and were in almost constant use.

Mount Revelstoke National Park

This park is situated on the alpine plateau that forms the summit of Mount Revelstoke, on the western slope of the Selkirk Mountains. A camp-ground has been laid out, and the chief recreations are fishing and hiking. Motor highways total 19 miles, and trails 45 miles. The park, established in 1914, contains an area of 100 square miles and is reached from Revelstoke by a spectacular motor highway.

As there is no resident superintendent, an actual check of visitors is not maintained. However, based on the registration at the lookout station, it is estimated that approximately 6,000 persons entered the park, a considerable decrease from the previous year. Cars shipped over the Canadian Pacific Railway line between Revelstoke and Golden numbered 701 as against 707 last year.

Work carried out on roads, trails, and telephone lines was confined to general maintenance, no new construction being undertaken.

No forest fires occurred in the park, although periods of high hazard were experienced, and fires were reported on provincial lands adjacent to the park boundary. Improvements included erection of one new water reservoir. There are now five large reservoirs in the park used to store water for fire protection purposes. In case of fire, hose is coupled directly to the reservoir and the water discharged by gravity.

All wild life is reported to be in good condition and plentiful. Bird life is abundant with a noted increase in grouse.

Mount Revelstoke maintained its popularity as a ski-ing centre, and was the scene of the Western Canada Ski Championship Meet, which was held at Revelstoke from February 9 to 12. It is estimated that over 5,000 people were in attendance including representatives from many parts of Canada and the United States.

Point Pelee National Park

This park occupies the most southerly mainland point in Canada. It is a recreational area noted for its unique flora and fine bathing beaches, and is the resting place for migratory birds during the seasonal flights. There is a motor camp-ground in the park, and approximately 10 miles of motor roads and one-half mile of secondary road. During the year the Post Property, an extremely valuable area comprising some 170 acres situated near the extreme south end of the park, was purchased by the Department. The park was established in 1918 and has an area of 6·31 square miles.

There was a considerable decrease in tourist travel into the park as compared with the previous year. The tourist figures for 1938-9 are: Canadian motor vehicles, 22,132, carrying 77,461 passengers; United States motor vehicles, 35,920, carrying 125,719 passengers; a combined total of 58,052 motor vehicles, and 203,180 passengers, or a decrease of 93,158 persons from the previous year. A total of 901 camping permits were issued as against 1,035 last year. This was the first year it was possible to keep accurate check on the number of visitors, so that the decrease may not be as great as the figures would imply.

Improvements carried out during the year included: Completion of approximately 3 miles of new road on the east beach, construction of approximately 3,700 feet of timber groins to protect the east beach from erosion, and one additional gateway building. A new water system was installed consisting of 14 new wells located as follows: 1 at the park entrance, 1 at the newly-acquired Post property, 1 at the refreshment booth, and 11 to serve camping areas on the west shore between the cross roads and gateway entrance. These wells were built according to National Health Department specifications, and provision made for chlorination to ensure an adequate supply of pure drinking water. These new wells replace some 36 sandpoints formerly used, and which were found unsatisfactory from a health point of view.

The smaller mammals, including rabbit, squirrel, groundhog, racoon, fox, and muskrat, are thriving and appear to be increasing. Muskrat were particularly numerous, and it was agreed that in the best interests of the park, 3,000 should be removed. Point Pelee Park is also an important bird sanctuary, and during the migration period in the spring and autumn many kinds of waterfowl, including ducks, geese and swans, find a resting place. Due to the abundant supply of water in the marshes during the past few years waterfowl have been particularly numerous. Duck shooting permits sold during the year totalled 265. Among the land birds, quail are quite numerous and many species of smaller birds are abundant throughout the park.

Prince Albert National Park

Prince Albert National Park embraces 1,869 square miles of lake and forest land, and contains a remarkable system of waterways and many interesting forms of wild life. The townsite of Waskesiu is a popular summer resort with an up-to-date camp-ground. Recreations are golf, tennis, fishing, bathing, canoeing, and boating. There are over 63 miles of motor highways and 75 miles of secondary roads in the park, and in addition 390 miles of trails. The park was established in 1927.

Registration of visitors at the park entrance gate surpassed all previous records. The figures follow: Canadian motor vehicles, 7,777, carrying 29,127 passengers; United States motor vehicles, 137, carrying 600 passengers. Combined total, 7,914 motor vehicles and 29,727 passengers as compared with 7,475 motor vehicles and 28,846 passengers during the previous year. Although the majority of these visitors were residents of Saskatchewan, tourists from six other Canadian provinces and 25 States of the United States were among those who registered at the park gateway.

Health conditions throughout the season were generally good, and no cases of contagious disease were reported. Tests of drinking water used in the townsite were carried out weekly and hypochloride of lime introduced into the water system. A new chlorinating plant has been purchased and will be installed prior to the opening of the 1939 season.

The camp-grounds continued to be a great source of attraction to the public, and at times all available space was occupied. Activities carried on under the direction of the camp-grounds caretaker included sing-songs, moving pictures, ping-pong and bridge tournaments, weiner and marshmallow roasts, softball games, and organized boat trips.

The number of visitors making use of the camp-grounds totalled 7,057, as compared with 5,250 during the previous year. Registrations at the various camp-grounds were as follows: Waskesiu, 6,874; Crean Lake, 140; Kingsmere Lake, 23, and Clearwater Lake, 20. Motor vehicles numbered 1,856, an increase of 609 over the corresponding period last year.

Construction during the year was as follows: New living quarters at Waskesiu for the resident engineer, a new warden's cabin at Crean Lake, a patrol cabin and stable at Beehive Lake, a patrol cabin on the third meridian in Sec. 1, Twp. 60, Rge. 1, a new comfort station in the Lakeview sub-division.

two brick chimneys in the bunkhouse at Meridian, and a brick chimney and furnace in Bittern Creek cabin. In addition the icehouse located at Camp No. 7 was moved to the permanent camp, the old warehouse at Crean Lake was moved to a new site and rebuilt, a building from MacKenzie Creek was moved to Silver Grove for a stable, and the wet well at Waskesiu was lined with concrete. Two small dams were constructed, one at the outlet of Crean Lake and one at the mouth of Kingsmere River.

All park roads and trails were maintained in good condition. Improvements carried out on the Prince Albert Park Highway included straightening of dangerous curves. One-quarter mile of highway and three and one-third miles of streets in the townsite were treated with oil. Construction and rebuilding of secondary roads totalled 41·7 miles as follows: Meridian Highway to Rabbit cabin, 8 miles; Rabbit cabin to Boundary cabin, 32 miles; and Prince Albert Park Highway to Summit tower, 1·7 miles.

Construction of new trails was as follows: German Crossing cabin to lookout tower, 3 miles; Boundary cabin to lookout tower, 3 miles, and Prince Albert Park Highway to Bluebell tower, 300 yards. In addition, old trails were improved as follows: Fifty-six trail, from Prince Albert Highway to Moose Cabin trail, 25 miles; Fifty-seven trail, from Boundary cabin to the Narrows Highway, 32 miles, and Moose Cabin trail, from Rabbit cabin to Fifty-six trail, 27 miles.

The bridge across Shoal Creek was completed, and smaller bridges and culverts replaced and constructed where necessary.

Additions to the forest fire protection system included erection of three 80-foot steel towers in districts Nos. 4, 6, and 9; construction of foundation and transportation of steel for one 80-foot tower in district No. 3; construction of four secondary wooden towers varying in height from 42 to 50 feet in districts Nos. 1, 2, 5, and 7, and preparation of timber for the erection of one secondary wooden tower in district No. 3.

Sub-normal rainfall resulted in fairly high fire-hazard conditions throughout the season. A total of 8 fires occurred within the park and burned over an area of 67 acres, as compared with 23 fires and 9,867 acres burned in 1937. Fortunately, very little valuable timber was lost, 94 per cent of the area burned being young growth and grassland. Aerial patrols proved of great assistance in helping to detect and control fires.

Approximately six and one-fifth miles of new telephone line was constructed to connect existing lines with the new fire lookout towers. All park lines were overhauled and maintained in good order throughout the season.

Considerable building was undertaken by private individuals. In the business section there was erected an addition to the laundry, one new store, and a new bungalow concession on which fourteen cabins were constructed of log siding. In the residential section at Prospect Point, one new residence was built. In addition, four blocks of the public camp-grounds were set aside for cottages of a cheaper type, and 20 cottages were erected and 7 new bungalows were added to the Waskesiu bungalow camp. Work undertaken by the Government included construction of a new barracks for the Royal Canadian Mounted Police and dredging of the area inside the breakwater, from which approximately 15,000 cubic yards of material was removed.

The park museum continued to be popular and attracted 10,529 visitors.

A program of mosquito control was carried out in the spring with very satisfactory results.

An increase has been noted in all species of wild life with the exception of moose, white-tailed deer, coyote, and bear. The greatest increases were among elk and beaver, with rabbits and muskrat also coming back. White-tailed deer, moose, and coyotes are not so numerous as in former years, and for some unknown reason bear have practically disappeared from Waskesiu townsite and vicinity. The small herd of buffalo wintered well, and now numbers ten, an increase of three over the previous year. Bird life is plentiful with many species of ducks and pelicans particularly noticeable.

Stocking of Waskesiu Lake with small mouthed black bass was continued, and a shipment of 472 fish was released in June. Fairly good catches of lake trout were reported from Crean and Kingsmere Lakes, but great northern pike and pickerel do not appear to be as plentiful as in former years.

Under the supervision of the Dominion Forest Service, sanitation cuttings were carried out over a distance of 18 miles along the Heart Lakes and Narrows roads, for five miles along the Waskesiu-Prince Albert Highway from the museum to the Narrows road, and for 2½ miles from the park boundary to the buffalo paddock. In addition thinnings and release cuttings covering approximately 65 acres were carried out around Waskesiu townsite and on the Narrows road.

The golf course proved to be more popular than ever, with the number of permits issued passing all previous records. A total of 3,563 single-round tickets, as well as 127 daily, 85 weekly, 3 monthly, and 18 seasonal tickets were issued. The men's Provincial golf tournament was held early in July, and the Park annual golf tournament, known as the Lobstick golf tournament, was held early in August. Other sporting events of interest included the senior and junior tennis tournaments, the annual swimming meet, the annual regatta, and a girls' soft-ball tournament. Three boat trips were organized for boys and girls.

In May, the Superintendent in co-operation with the United States Highway 85 Association carried out a lecture tour in the United States. Park films were shown and literature distributed en route. A transcription of activities in and around Waskesiu was prepared by officials of the Canadian Broadcasting Corporation, and was broadcast on August 17.

Prince Edward Island National Park

This park embraces a coastline strip, about 25 miles in length, on the north shore of Prince Edward Island, and includes some of the finest sand beaches in Eastern Canada. The park was established in 1936 with an area of 7 square miles. It is being developed as a recreational area in keeping with national park standards.

Although no official record of visitors was kept, it is estimated that approximately 10,000 persons visited the park during the year.

One business licence and 28 hay permits were issued during the year.

All areas known to be infested with poison ivy were sprayed with atlacide, with the result that practically all the plants were either killed or prevented from producing seed. During the summer season the bathing beaches were cleared of driftwood and debris.

New construction included the completion of two bath-houses at Dalvay and Cavendish, and the construction of one permanent and two portable bath-houses at Brackley. Improvements to existing buildings were as follows: At Dalvay House application of three coats of stucco, exterior decoration, reconstruction of veranda, and construction of toilet rooms; at Green Gables replacement of sills and floor joists, excavation for replacement of cement foundation under kitchen and repairs to stone foundation under main building, shingling kitchen walls and roof of main building, staining roofs, construction of one double dormer window and replacement of frames and sashes, construction and hanging of shutters, painting, erection of one partition, laying of floors, and excavation for septic tank. At the Superintendent's residence, reconstruction of foundation, construction of two dormer windows, fireplace, chimney, front entrance and closets, shingling and staining of roofs, plastering, laying new

floors, exterior and interior decoration, and installation of plumbing and electric wiring. In addition the moving of the old barn at Green Gables and three outbuildings at Dalvay has been completed. Plans were drawn up for the improvement and landscaping of grounds surrounding Dalvay House. Approximately 3·17 miles of boundary fence was erected. Two new wells were drilled, one at Dalvay House and one at Brackley Beach.

Roadwork was limited to maintenance of existing road and completion of approximately three miles of new road between the eastern entrance at Dalvay and the western extremity of the Dalvay-Stanhope section. One new bridge was constructed across the outlet of Long Pond.

Wild life in this area is fairly well limited to waterfowl, shore, and land birds. Several species of ducks, Canada geese, plover and snipe were seen frequently but were not present in large numbers, probably owing to the construction work which was being carried out in the vicinity. Ruffed grouse and Hungarian partridge wintered well and are reported to be increasing.

In general the waters in this area are suitable for trout, and although no official record was kept, some good catches were reported from the Lake of Shining Waters.

No recreational facilities have yet been provided, but the park beaches continued to be popular, and attracted many visitors. Construction of an 18-hole golf course in the Cavendish area was started in July. This work progressed very favourably throughout the season, and it is expected that the first nine holes will be ready for play by July, 1939, and the second nine before the end of the season.

Riding Mountain National Park

This park is a rolling woodland on the summit of the Manitoba escarpment, dotted with many sparkling lakes. It is a big game sanctuary, summer resort, and recreational area. Motor camp-grounds are provided and recreations include swimming, golf, tennis, bathing, and riding. A wild animal enclosure contains small herds of buffalo and elk. The total length of motor highways is 50 miles and secondary roads 54 miles. In addition there are approximately 113 miles of trails. The park was established in 1929 and covers an area of 1,148 square miles.

Registration of tourists at the park gates showed a gratifying increase, and was as follows: Canadian motor vehicles, 31,983, carrying 119,628 passengers; United States motor vehicles, 1,229, carrying 4,831 passengers. Combined total, 33,212 motor vehicles and 124,459 passengers, compared with 29,864 motor vehicles and 117,253 passengers during the previous year. An increase was particularly noticeable in tourists from the United States, who numbered 4,831 as against 3,386 last year. It is worthy of note that a new high record has again been established for the park. The popularity of the park as a meeting place for conventions was maintained, with many social and professional organizations holding their meetings in the park.

During the year a total of 22,005 licences and permits were issued as follows: business licences, 193; building permits, 21; camping permits, 1,463; lot rentals, 220; grazing permits, 106; hay permits, 414; timber permits, 1,375; transient motor licences, 18,031; and miscellaneous, 182.

Registration of campers at Wasagaming camp-ground totalled 4,761 persons as compared with 6,774 last year. These visitors spent 48,658 person-days in residence, or an average stay of 10·2 days per person. The decrease in campers this year was attributed to the wet weather experienced during the month of August. Activities organized by the campers included concerts in the jamboree building, sing-songs, soft ball games, and a horseshoe pitching tournament. The Lake Katherine camp and picnic grounds, and the picnic grounds at Moon Lake were well patronized throughout the season as picnic spots, but very little camping was done at either.

New construction in the townsite by private enterprise, included an additional bungalow camp of ten units, a new lodge, and one new cottage. In addition considerable improvement work was done on a number of existing business places.

New construction undertaken by the Government included four tower-observer's cabins in the Dauphin, Kelwood, Elphinstone and Russell districts and three patrol cabins in the Kelwood, Russell, and Grandview districts. Improvements included remodelling of the staff quarters to provide additional accommodation, and minor improvements to the Superintendent's residence, administration office, and museum.

Two wooden lookout towers 20 feet in height were constructed for the use of tourists at lookout points on the Dauphin and Norgate highways. Parking areas were built at these points, and also on the Dauphin highway adjacent to the Clear Lake tower.

All park roads were maintained in good condition, the main roads being kept open for necessary communication during the winter. Bridges on the Lake Audy and Dauphin-Clear Lake roads were repaired and a considerable amount of new guard-rail constructed on the latter. New construction totalled 19½ miles of secondary road as follows: to Dauphin tower, 7 miles; to Kelwood tower, 1 mile; and to Rossburn tower, 11½ miles.

Considerable maintenance work was undertaken on park trails, and in addition approximately 14 miles of new trail was constructed running west from Lake Audy to Gunn Lake and two miles east from Gunn Creek crossing. Major improvements included construction of permanent bridges on the Birdtail Valley trail at Blackstone and Gunn Creek crossings.

General revision of the telephone system was undertaken, which included construction of 46 miles of new lines to connect up the various fire lookout towers, and temporary repairs to existing lines. An additional line was run from the North Gate to connect with the Manitoba Telephone System.

The existing fire protection system was extended by the erection of seven steel lookout towers varying in height from 40 to 100 feet. Five of these towers are located within the park and two on the plains outside the park boundary. All towers within the park are connected by telephone.

Forest fire conditions were more favourable than last year, the spring fire season being moderate with the worst periods of hazard developing in the autumn. Sixteen fires occurred which burned over a total of 2,780 acres, as compared with 36 fires and 11,919 acres burned during the previous year. Of the area burned during the current year approximately 20 per cent was grassland and 26 per cent old burn. Air patrols were again active during the spring and autumn fire seasons and proved of considerable value in the detection of fires.

Work carried on in the townsite included operation of municipal services, and maintenance of streets, walks, grounds, lawns, and flower beds, including those in the vicinity of the golf club-house and the "Wishing Well." Only two small fires occurred in the townsite, both of which were extinguished by the volunteer fire brigade before any serious damage was done. The park museum was open to the public daily throughout the season, and as usual attracted a large number of visitors.

All forms of wild life came through the season in good condition, and showed normal increases in numbers. Moose, elk, mule deer, and white-tailed deer are reported to be plentiful. Among the smaller animals a new colony of beaver has been seen northeast of Clear Lake; skunk are numerous, and rabbit and coyote are scarce. The animals in the enclosure at Lake Audy at the end of March numbered as follows: buffalo, 59; elk, 55; moose, 4; white-tailed deer, 5; mule deer, 4. Combined total, 127. The exhibition animals continued to be a source of interest to visitors, and during the season over 5,000 people visited the enclosure. In order to avoid congestion in the enclosure, 16 buffalo were

slaughtered in the autumn, and the meat and hides disposed of by auction. Bird life was plentiful, with a marked increase in migratory waterfowl, including many species of ducks, geese, whistling swans, and cormorants. A slight increase was noted in grouse.

During the year 31 prosecutions were instituted for infringement of the Game Act, and 30 convictions were secured, one case being withdrawn for lack of sufficient evidence.

The fish-rearing ponds which were constructed in 1936 continued to be a source of interest to park visitors. Early in May 250,000 rainbow trout fry were received from the provincial hatchery at Fort Qu'Appelle and transferred to the fish-rearing ponds. The fish remained in the ponds throughout the season and were distributed in Clear Lake in October. Improvement work carried out in the vicinity of the rearing ponds included laying out of walks, planting of shrubs and perennials, and sanitation cuttings.

Fishing in Clear Lake has shown a marked improvement over the past few years, many excellent catches of northern pike being reported. One 22-pound pike taken in Clear Lake was reported to be the largest caught in Manitoba during the season. The rainbow trout released in Clear Lake in 1937 are reported to be doing well and to have shown satisfactory growth. Lake Audy and Moon Lake also provided some good fishing.

Cutting of saw-timber and fuelwood in the park was again carried out under the annual budget plan adopted last year. In comparison with the fiscal year 1937-8, this year's cut showed a slight increase but was well within the limits allowed by the working plan.

Under the supervision of the Dominion Forest Service the following improvement work was carried out: sanitation cuttings and thinnings were made over an area of 1,423 acres bordering on the Dauphin and Norgate Highways, the North Shore Drive, the Lake Katherine road, and in the vicinity of Wasagaming townsite. Thinnings were confined to young stands, and sanitation cuttings applied to mature stands. All brush was burned, unmerchantable material was skidded back from the highway or burned, and the remainder utilized for fuel. The planting program included setting out of exotic species from Morden, Manitoba, at the three main gates and around the administration building and transplanting of white spruce from the Lake Audy nursery in the camp-grounds and at various points in the townsite. At the golf course white spruce and jack pine were planted in the vicinity of the greens and tees.

Many concerts conducted by the campers were held in the jamboree building and attracted a large attendance. Swimming and boating at Clear Lake continued to be popular and were under the supervision of a lifeguard. A regatta sponsored by the Wasagaming Board of Trade was put on in July. The girls' annual softball tournament was held in August with five teams competing. The sixth annual tennis tournament sponsored by the Wasagaming Board of Trade was held in August at Wasagaming, and attracted 250 players. The children's playground, which adjoins the tennis courts, was open throughout the season, and proved a great attraction to the youngsters.

The park golf course was maintained in good condition and continued to be one of the main sources of attraction. A total of 5,833 single-round tickets as well as 139 daily, 55 weekly, 3 monthly, and 8 seasonal tickets were issued. The Wasagaming Golf Club tournament was held in July and drew a record entry of 106.

St. Lawrence Islands National Park

St. Lawrence Islands National Park is composed of thirteen islands among the Thousand Islands of the St. Lawrence River, together with a small mainland area at Mallorytown Landing, Ontario. The islands include Cedar, near Kingston; Aubrey, Mermaid, Beau Rivage, Camelot, Gordon, and Endymion, near Gananoque; Georgina and Constance, near Ivy Lee; Grenadier (portion) near Rockport; Adelaide, near Mallorytown Landing; Stovin, near Brockville; and Broder, near Morrisburg, Ontario.

These island parks are delightful recreational areas for campers and picnickers, and several of the large islands, notably Beau Rivage, are used extensively for summer camps of Girl Guides and similar organizations. Each island or group of islands is in charge of a caretaker, who is responsible for the care and maintenance of the docks, shelters, camp-stoves, and other conveniences that have been provided for visitors. The park was established in 1914, and contains 185·6 acres.

During the past year it is estimated that 21,150 persons visited the island parks, a small decrease from the previous year. Improvements carried out during the year included erection of new flag poles on Cedar and Gordon Islands. All other work was of a general maintenance character.

Waterton Lakes National Park

(Canadian Section, Waterton-Glacier International Peace Park)

Waterton Lakes Park is a mountain playground of unusual charm on the eastern slope of the Rockies. Its varied flora and fauna, and the opportunities for such forms of recreation as swimming, boating, climbing, hiking, riding, golf, and tennis make it extremely popular. There are 44·5 miles of motor highways, 3 miles of secondary roads, and 240 miles of trails. It was established in 1895 and has an area of 220 square miles.

The volume of tourist travel to the park, surpassing all previous records, was as follows: Canadian motor vehicles, 11,811, carrying 44,203 passengers; United States motor vehicles, 11,371, carrying 42,184 passengers; foreign motor vehicles, 41, carrying 130 passengers. Combined total, 23,223 motor vehicles and 86,517 passengers, as compared with 14,591 motor vehicles and 59,520 passengers during the previous year.

The Information Bureau was open from June 15 to September 15, during which time 13,010 inquiries were dealt with. This total was made up as follows: Canadian, 4,430; United States, 7,940; other foreign, 41; and miscellaneous, 599.

A total of 12,531 licences and permits were issued during the year as follows: general revenue receipts, 982; timber permits, 34; general licences, 89; camping permits, 431; transient motor licences, 10,921; and miscellaneous, 74. Revenue from this source showed an increase of 76·4 per cent over the corresponding period last year.

Throughout the year, health conditions in the community were generally good, with a total absence of communicable disease. All milk and water supplies were subjected to frequent tests, and constant supervision was maintained over all matters affecting public health.

Registration at the park camp-grounds showed a decided increase, totalling 1,709 persons, as compared with 1,422 during the previous year. A total of 431 camping permits were issued, covering a combined stay equivalent to 11,986 person-days. The average stay was 7·01 days per person. The camp-grounds at Cameron Lake and Red Rock Canyon continued to be popular and attracted many visitors.

In the townsite new construction was limited to the erection of a new dance hall, store, hotel, and three additional cabins at the auto bungalow camp. Work undertaken by the Government included completion of the fish ponds cabin, painting the shelter at the children's playground, and stuccoing and painting the exterior of the Administration building. Outside of the townsite a summer cabin was erected at Hell Roaring Creek, kitchen shelters were completed at Crandell, Bertha, and Crypt Lakes, and all warden's cabins were maintained in good repair. In addition the dining lodge and kitchen of the Lethbridge Y.M.C.A.

on Lower Waterton Lake was completed. Old relief camp No. 5 was dismantled. Two additions were made to the Government wharf and a new wharf was constructed by the Park Transport Company.

Road work was confined to general maintenance of park roads, including applications of oil on certain sections. On the Main Entrance road, widening was undertaken near Waterton cabin, above lower Waterton Lake and near Mile 0·10. On the Akamina road, 10 culverts were replaced and the decking and stringers renewed on the bridge near Mile 7. On the Pass Creek road, revisions were made at Miles 0·2, 0·6, 4·0, and 4·9; the decking and stringers were renewed on a bridge near Mile 5·8 and the abutments, timbers, stringers, hand rail, and wheel guard were all renewed on the Upper Pass Creek bridge. The road to the Prince of Wales Hotel was widened from 16 to 20 feet. All streets in the townsite and camp-ground roads were maintained in good condition, and a marked improvement resulted from a more liberal use of oil than in 1937. Work was commenced on rebuilding the Lower Cameron Creek bridge. The piers and abutments have been completed and stringers placed in preparation for the completion of the bridge.

All park trails were maintained in good condition, and in addition 4·25 miles of new construction was carried out as follows: Bow Lake trail, 1·25 miles; Goat Lake trail, 1·75 miles; from bath-houses at Lake Linnet around Prince of Wales Hotel to Pincher Creek, 0·75 miles, and from bath-houses around east side of Lake Linnet, 0·50 miles. In addition a new bridge was constructed across the outlet from Cameron Lake. It is interesting to note that the use of park trails by the visiting public has increased considerably during the past few years. Work on telephone lines was restricted to general maintenance of existing park lines.

Wild life in general is reported to be in good condition. Increases have been noted in elk, mule deer, sheep, beaver, otter, and snowshoe rabbit, and slight decreases have occurred in marten, mink, lynx, and weasel. White-tailed deer remain about the same. Among the predators, coyote are plentiful and two cougar were seen. However, it is not considered that the latter has its regular habitat in the park. Small birds appear to be on the increase, particularly in the vicinity of the townsite. Ruffed grouse are plentiful and have shown a marked increase, and sharp-tailed grouse have decreased slightly.

Fishing during the 1938 season continued to be good, with many excellent catches of fish reported. Several lake trout weighing over 20 pounds were taken from the main Waterton Lake, and good catches were also reported from Cameron, Bertha, Alderson, Carthew, and Crypt Lakes. Stream fishing was rather poor, although better catches than last year were reported from Belly River. In accordance with recommendations made by the Biological Survey, a concession was let to net whitefish in lower Waterton Lake, and a total of 1,421 pounds were taken during the season. During the year the following distribution of fry and fingerlings was made from the Waterton Hatchery: in park waters—salmon trout, 5,150; cut-throat trout, 1,260; rainbow trout, 7,463; total, 13,873; in provincial waters—rainbow trout, 201,128; cut-throat trout, 120,500; total, 321,628. Approximately 18,580 speckled trout eggs and 203,770 rainbow trout eggs were kept at the hatchery during the winter. Improvements included installation of some 900 feet of 8-inch wooden-stave pipe between the source and present intake of water supply.

No forest fires occurred in the park during the past season. One fire occurred in the townsite, which resulted in the complete destruction of a private residence.

Sixteen grazing permits were issued covering a total of 1,492 head of stock. This was a decrease of 92 head from the previous season. Approximately 75 tons of mixed timothy and brome hay were harvested, of which 55 tons were baled and distributed among the various warden stations and headquarters for feeding Government stock.

In accordance with recommendations made by the Dominion Forester and Dominion Entomologist, dying lodgepole pines in the vicinity of the townsite which were infested with bark beetles were cut down and burned. Throughout the summer season specimens of forest insects were collected by the warden service and forwarded each month to the Dominion Entomological Laboratory at Vernon, B.C., for purposes of identification.

The park golf course was maintained in good condition, with 18 holes in play throughout the season. Improvements included top dressing, seeding, and elevation of certain tees which were in need of adjustment. The annual golf tournament was held early in August, and attracted about 96 competitors, the largest number on record. The four tennis courts and children's playground were in constant use. The baseball diamond was kept in good condition, but was not as well patronized as in former years. The bathing beach at Lake Linnet was as usual well attended, and a life-guard was employed to supervise aquatics during July and August.

Yoho National Park

Yoho Park on the western slope of the Rockies contains the famed Yoho Valley with its numerous waterfalls, the Kicking Horse Valley, and Lakes Emerald and O'Hara. Motor highways have a total length of 44 miles, secondary roads 6 miles, and trails 192 miles. Established in 1886, the park has an area of 507 square miles.

Tourist traffic showed a marked increase over the corresponding period last year. The number of cars entering the park showed only a slight increase, the main increase being accounted for by visitors travelling by rail. Traffic from Banff by way of Kicking Horse Pass, which is not registered at the Leanchoil gateway, was again recorded by an automatic registration device installed west of the park boundary.

Tourist figures for the past 2 years are given in the following table:—

Visitors to Yoho National Park

Route	Motor Vehicles		Passengers	
	1938–9	1937–8	1938–9	1937–8
Eastbound—				
Via Leanchoil Gate	1,990	2,343	5,861	7,021
Westbound—				
Recorded automatically (estimated four persons per car)	12,954	12,884	51,816	51,536
Visitors by rail (estimated)	.....	.....	7,000	2,000
Totals	14,944	15,227	64,677	60,557

Health conditions in the townsite throughout the year were generally good, with no cases of infectious diseases being reported. Regular inspections were made of business premises and camp-grounds, and every effort was made to maintain them in a sanitary condition.

Registration of campers at the public camp-grounds showed a decrease from last year. A total of 1,051 motor vehicles and 4,117 persons used the various camp-grounds as follows: Kicking Horse camp-ground, 986 motor vehicles and 3,944 persons, and Chancellor Peak camp-ground, 65 cars and 173 persons. Because of flooding from the Kicking Horse River, the Field camp-ground was not in operation during the past season. The decrease in registration of campers is probably owing to the fact that this was the first year that automobile owners were charged a fee for camping privileges.

All chalets and bungalow camps opened on June 15, and with the exception of Alton's auto bungalow camp, which remained open until the end of October, all closed on September 13. Improvements to tourist camps included a new five-room cottage at Yoho Lodge, and four new cabins at Alton's auto bungalow camp.

Work on park roads was limited to general maintenance including application of oil for dust prevention. The Field-Golden Highway was opened on May 4, and the Field-Banff Highway on May 14. Branch roads were a few days later in opening. The Ottertail road was opened only as far as Boulder Creek (3½ miles west of Field), the old Boulder Creek bridge being considered unsafe for heavy traffic. Streets in the townsite were graded and oiled.

Work on trails was confined to general maintenance and the construction of two new bridges on the Beaverfoot trail. This trail is now passable for light cars from Leanchoil to the mouth of the Ice River.

All park telephone lines were maintained in good condition. Improvement work included replacing of the galvanized iron wire on the Stephen-Hector section with copperweld wire.

It is gratifying to note that only three small forest fires occurred, all of which were quickly extinguished without any loss. One fire occurred in the townsite which destroyed a private residence. This was the first fire to occur in the townsite over a period of 23 years.

Wild life is reported to be plentiful and has come through the season in good condition. Fur-bearers appear to be on the increase and predators are scarce. Fishing in the park continued to be popular, and many good catches were reported from Lakes Wapta and O'Hara and Cataract Creek. A total of 41,000 rainbow trout fry from the Banff Hatchery were placed in Lake O'Hara and Cataract Creek.

During the past winter a local ski club known as the Kicking Horse Ski Club was formed with a membership of forty-four.

Animal Parks

Buffalo National Park

This enclosure, near Wainwright, forms the largest fenced wild animal preserve in Canada, and is the home of a large herd of plains buffalo, and smaller herds of moose, deer, elk, yak, and hybrids, the latter segregated for experimental cross-breeding purposes. There are 2 miles of motor highway, 25 miles of secondary roads, and 57 miles of trails in the park, which was established in 1908, and contains an area of 200·5 square miles.

During the year a total of 10,960 persons visited the park, as compared with 9,830 for the corresponding period last year.

Permits for 46 cords of dry wood and 8,500 willow fence posts were issued to settlers in the vicinity of the park.

Work on roads and trails was confined to general maintenance of the motor road and trails.

All park telephone lines were maintained in good condition, repair work including replacement of 36 poles, resetting of 48 old poles, and replacement of a number of side brackets. Maintenance and necessary repairs were carried out on approximately 120 miles of eight-foot, and 10 miles of ordinary fence, and included replacement of 1,904 fourteen-foot posts, 110 eight-foot posts, and resetting of approximately 2,500 old posts.

No fires occurred in the park during the year. As a measure of protection against fires originating outside the park, approximately 140 miles of 20-foot fireguard were ploughed on both sides of the main fence, and also across the park at intervals. Inspections of stovepipes and chimneys at the various buildings were made periodically.

New construction included a small registration booth at the home paddock entrance, a pump-house over Number 2 well in the main park, and a two-car garage in the home paddock. Alterations and repairs were made to the stock sheds in the cattalo enclosure; repairs and improvements to buildings at the abattoir and home paddock; improvements to the abattoir, including painting of the interiors of the killing room, men's washroom, office, and inspector's quarters. At Ribstone Meadow the interiors of the sleeping camps and cook and dining camps were painted, and at the farm the interior of the large granary was painted and repairs made to the driveway leading to the upper floor.

For the purpose of improving watering facilities in the main park, a change was made in the west boundary fence to provide access to a spring which had been outside the animal enclosure. In addition a small concrete dam was constructed across the outlet from Channell Spring, a catch basin installed and the head of the spring fenced to prevent trampling.

Approximately 430 acres were seeded to oats, of which 350 acres were threshed and 80 acres left for green feed. Returns from farming operations were as follows:— oats, 11,308 bushels; straw, 220 tons; green feed, 68 tons; brome grass seed, 5,600 pounds; hay (cultivated), 250 tons; (wild) 1,750 tons. As an experiment, about 3 acres were seeded to crested wheat grass. Owing to increased precipitation the hay crop was exceptionally good.

The herds of big game animals in the park, which include buffalo, moose, and mule deer, are all maintaining a satisfactory increase. In accordance with the policy of the Department, the herd was reduced by the slaughter of 1,226 buffalo and 485 elk. This work was carried out in the late autumn when the animals were in prime condition. Twenty-six buffalo carcasses were reserved for the use of the Department, and the remainder disposed of by contract. In the case of the elk, the carcasses and hides were shipped to various Indian Agencies, in Manitoba, Saskatchewan, and Alberta. At the end of the fiscal year the number of animals in the park was as follows: buffalo, 2,492; moose, 137; elk, 1,674; mule deer, 842; yak, 36; and mixed breeds, 88.

An epidemic of encephalomyelitis, which swept over the western provinces, was responsible for the death of many horses. However, the prompt action of park officials in having all park horses vaccinated, prevented losses in the park.

As a result of increased precipitation and more water in the small sloughs, there was a notable increase in waterfowl, which, owing to drought conditions which have prevailed during the past few years, had become quite scarce. A marked increase was also noted in sharp-tailed grouse.

Donations made during the year included one pair of buffalo and one pair of yak to the Moose Jaw Wild Animal Park Society, Moose Jaw, Saskatchewan; one male buffalo mounting specimen to the New York Natural History Museum, New York; three elk mounting specimens to the Natural History Museum, Hamburg, Germany, and two male elk heads to the Hudson's Bay Company.

The only recreational facilities provided are the picnic grounds and bathing beach at Mott Lake, both of which were well patronized throughout the season.

Elk Island National Park

This park consists of a fenced enclosure near Lamont, Alberta, containing buffalo, moose, mule deer, and elk. A recreational area has been developed and opportunities provided for golf, camping, bathing, and boating. Motor highways have a total length of 16 miles, secondary roads 2 miles, and trails 4 miles. The park was established in 1911 with an area of 51·2 square miles. Although originally intended as a big game preserve, this park has in recent years developed into a very popular recreational resort.

During the year tourist travel to the park was as follows: Motor vehicles 16,973, carrying 73,056 passengers, as compared with 17,380 motor vehicles and 63,040 passengers during the previous year.

Roadwork was restricted to general maintenance and included re-surfacing of approximately 8 miles with gravel, construction of 24 culverts, and one Texas gate. Existing fences were maintained in good condition by replacing and re-setting of posts.

New construction included a hide room, an extension to the cooler at the abattoir, a combined blacksmith shop and tool shed, a pump-house, and drilling of a new well at the abattoir. Improvements included relining the bunk-house, moving a building from headquarters to golf course to provide a barn, re-decorating interiors of golf club-house, office, gateman's cabin at north gate, warden's cabins and Superintendent's residence. Landscaping and planting of trees and shrubs were carried out at the Superintendent's residence, the golf club-house, the gateways, and at Sandy Beach; in addition an area adjacent to Sandy Beach was cleared to provide a new parking area, and the old refreshment booths moved to the south and west gates for the use of the gatekeepers.

Approximately 125 acres were sown to oats and yielded the following returns: 3,325 bushels of oats, 149 loads of oat sheaves, and a large quantity of straw. In addition approximately 450 tons of hay were harvested from Goose Lake Meadow.

One small fire occurred within the park. As a fire protection measure the Oster and Grassy Lake trails which divide the park east and west, were cultivated and graded, other fireguards were ploughed to a greater width, and where possible partially dried sloughs were cultivated parallel to the fence.

The big game animals in the park, which include buffalo, elk, moose, and mule deer, are generally in good condition. In accordance with the policy of the Department, a total of 1,035 animals were slaughtered for the Indian Affairs Branch and for other use, and included the following: 800 buffalo, 134 moose, and 101 elk. At the close of the fiscal year the number of the animals in the park were: buffalo 995, elk 473, moose 99, mule deer 27. During the year one pair of buffalo and one pair of elk were donated to the Wellington Zoological Gardens, New Zealand, and one buffalo cow was loaned to the Edmonton Zoological Society. An extensive survey of bird life was carried out, and for the purpose of obtaining migration information, 684 birds representing 60 species were banded.

The golf course was used extensively. Some 400 tons of top dressing were spread on the fairways, the pipe-line was extended to provide water for the tees, a new bunker and trap was constructed on No. 2 fairway, and a new tee on No. 4 fairway. At Sandy Beach an area was cleared to provide a baseball diamond. All recreational facilities provided by the park were well patronized.

Nemiskam National Park

Nemiskam National Park, Alberta, is a fenced reserve, covering an area of 8·5 square miles. It was established in 1922 for the protection of prong-horned antelope, of which it has a herd of more than 100. Visitors to the park during the year numbered 20.

Range conditions were better than during the past few years, the hay crop being very good. Work carried out during the year included general maintenance of fences, clearing weeds from water courses, constructing a rock crossing across one of the creeks, and general repairs to barns and corrals.

Wawaskesy National Park

In 1914 an area of 54 square miles in southeastern Alberta, was reserved for the protection of the rapidly diminishing herds of prong-horned antelope. It was established as Wawaskesy National Park and included in the National Parks system in 1922.

No development work was carried on in the area. By 1938, the number of antelope in the district had greatly increased, thereby removing the need for the continued reservation of the park area. Consequently it was decided to abolish Wawaskesy National Park and allow the area to revert to the province. This was accomplished by Act of Parliament assented to on June 24, 1938.

Historic Parks

Fort Anne National Park

This national historic park at Annapolis Royal is on the site of the early Acadian settlement of Port Royal. It contains a historical museum with a fine library. Established in 1917, the park has an area of 31 acres. Fort Anne National Park is one of the most notable of Canada's historic places. The fort to-day includes well-preserved earthworks and a large building erected in 1797 during British occupation. The building was restored in 1935 and serves as a museum.

Registrations at the museum totalled 12,050 persons, as compared with 12,029 during the previous year. In addition it is estimated that 5,000 persons visited the grounds without going into the museum, making a combined total of 17,050. Several travel groups from the United States and Canada, including teachers and pupils from Canadian schools, were among those who visited the park during the season.

An interesting event celebrated in July was the bicentenary celebration of the organization of the first Masonic Lodge in Canada at Annapolis Royal in 1738.

Interesting acquisitions to the park museum included the following: Copies of reports of H.R.H. Prince Edward, made when he was stationed in Nova Scotia; sketch of Fort Anne made in 1828; plan of part of the garrison ground of Annapolis Fort, dated September 26, 1818; model of Habitation of Port Royal; full dress helmet of 63rd Rifles; an old cannon ball picked up at Fort Anne; photostat copies of plans drawn by Engineer Delabat who supervised the building of Fort Anne; copies of reports sent from Port Royal by Engineer Delabat, and a considerable number of old books and documents.

Improvements carried out during the year included painting the outside of the museum building, plastering the chimneys, and installing transoms over the east and west doors. All other work undertaken was a of general maintenance character.

Fort Beausejour National Park

The site of old Fort Beausejour, located on the long ridge between the Aulac and Missaguash Rivers, and overlooking Chignecto Bay, forms one of the most interesting historic places in New Brunswick. The construction of the fort was begun by the French in 1751, under de la Jonquiere, Governor of Canada, but before its completion it was taken by the English under Colonel Robert Monckton, in 1755, and renamed Fort Cumberland. Under British rule the defences of the fort were greatly strengthened, and during the American Revolution of 1776, it withstood an attack by a force under Colonel Jonathan Eddy.

In 1926, an area of 59 acres, containing what remained of the fort, was set aside as a National Historic Park, and the original name "Fort Beausejour" was adopted. Since that time the remains of the fort have been repaired, points of interest have been marked, foot-paths constructed, drinking water provided, and a rest pavilion and other facilities made available for visitors.

In 1935, a museum was erected near the entrance to the fort, the official opening taking place on August 1, 1936, in the presence of several thousand people. The museum contains an interesting collection of exhibits, relating chiefly to the civil and military history of Chignecto, and the neighbouring

Counties of Westmorland and Albert in New Brunswick and Cumberland in Nova Scotia. The exhibits were generously contributed by residents of these districts.

During the year over 15,000 persons registered at the museum and last autumn it was found necessary to add a new wing to the building in order to provide accommodation for the new exhibits that have been received. Other work carried out during the year includes the erection of a cottage, with garage, for the use of the caretaker; the repairing of the old British well; the construction of a concrete base and carriage for the cannon presented by Dr. J. C. Webster, and the levelling and re-sodding of the parking areas.

HISTORIC SITES AND MONUMENTS

The restoration, preservation, marking, and administration of historic sites of national importance and the commemoration of the public services of outstanding persons connected with the early history of Canada have been entrusted to the National Parks Bureau. The Bureau is assisted in this work by the Historic Sites and Monuments Board of Canada, an honorary, advisory body, comprised of a number of recognized historians representing the various parts of the Dominion.

The personnel of the Board is as follows: Chairman. *Brig.-Gen. E. A. Cruikshank, LL.D., F.R.S.C., F.R.Hist., Ottawa, Ont.; His Honour F. W. Howay, LL.B., LL.D., F.R.S.C., F.R.Hist., New Westminster, B.C.; J. Clarence Webster, C.M.G., M.D., D.Sc., LL.D., F.R.S.C., Shediac, N.B.; Professor Fred. Landon, M.A., F.R.S.C., London, Ont.; Professor D. C. Harvey, M.A., F.R.S.C., Halifax, N.S.; Hon. E. Fabre-Surveyer, B.A., LL.M., B.C.L., F.R.S.C., Montreal, P.Q.; Rev. Antoine d'Eschambault, D.S.T., D.J.C., St. Boniface, Man.; J. A. Gregory, M.L.A., North Battleford, Sask.; F. H. H. Williamson, Controller, National Parks Bureau, Ottawa.

The annual meeting of the Board was held in Ottawa from May 19 to 21, when a number of new sites were reviewed and a selection made therefrom for attention at a later date. Of the total number of sites considered by the Board to date 276 have now been suitably marked and 178 additional ones recommended for future attention.

During the year the following sites were marked:—

Mohawk Indian Fort, Annapolis Royal, N.S.—A bronze plate affixed to an iron pedestal was erected on lower St. George Street to mark the site of the fort built in 1712 by Mohawk Indians under Major Livingston. The tablet was unveiled on August 29, 1938, under the auspices of the Annapolis Royal Historical Association.

Battle of Grand Pre, Grand Pre, N.S.—A cut stone monument with tablet was erected adjacent to the Provincial Highway to commemorate the engagement which took place on February 11, 1747, when New England troops under Colonel Arthur Noble were surprised and defeated by French and Indians under Coulon de Villiers. The British commander was killed and the French leader died later of his wounds. The monument was unveiled on September 5, 1938.

Halifax-Castine Expedition, Halifax, N.S.—A cut stone monument with tablet was erected on the grounds of Dalhousie University to commemorate the British military and naval expedition from Halifax in September, 1814, under Lieutenant General Sir John Coape Sherbrooke and Rear Admiral Edward Griffith, which occupied the portion of Maine between the Penobscot and St. Croix Rivers. Major General Gerard Gosselin governed that district, from Castine, until April 26, 1815. The customs duties collected during this period

*Brig.-Gen. Cruikshank died June 23, 1939.

were utilized by Governor Dalhousie for the endowment of the Garrison Library and Dalhousie College. The monument was unveiled on August 16, 1938, under the auspices of the Dalhousie Reunion Committee.

First Pictou Academy, Pictou, N.S.—A cut stone monument with tablet was erected adjacent to Church Street to mark the site of the first Pictou Academy which was erected in 1818 and demolished in 1932. Under the leadership and example of Dr. Thomas McCulloch it opened the door of opportunity to a hitherto neglected element of the population of the Maritime Provinces and gave to Nova Scotia and the Dominion of Canada many men who became prominent in journalism, literature, science, theology, education, and government. The monument was unveiled on August 15, 1938.

Major Thomas Dixson, Fort Beausejour National Park, near Aulac, N.B.—A tablet was affixed to the outer wall of the museum building in honour of Major Thomas Dixson, who during the siege of Fort Cumberland by rebels under Jonathan Eddy in 1776, made a perilous journey to Halifax, securing the assistance of a force which helped to rout the enemy and to save Nova Scotia for the Empire. The table was unveiled on July 24, 1938.

Prehistoric Indian Portage, Baie Verte, N.B.—A cut stone monument with tablet was erected adjacent to the Aulac-Port Elgin Highway to mark the route from the Gulf of St. Lawrence to the Bay of Fundy which was the chief means of communication between Quebec, Isle Royale, and Chignecto. The portage connected the Baie Verte and Missaguash Rivers. The monument was unveiled on September 4, 1938.

First Postal Service in Canada, Montreal, P.Q.—A tablet was affixed to the outer wall of the new Postal Terminal building, St. James Street, to commemorate the establishment of this service. From 1693 couriers carried the mail between Quebec and Montreal. In 1763 Benjamin Franklin, then Deputy Postmaster General in North America established the first organized postal service in Canada.

Struggle for Hudson Bay, Ville Marie, P.Q.—A cairn with table was erected on the Court House grounds to commemorate the capture in 1686, of three Hudson's Bay Company forts on James Bay, by a French force under Chevalier de Troyes, assisted by Canadians under d'Iberville, journeying overland by way of Lake Temiscamingue. The French retained possession until the Treaty of Utrecht in 1713. The monument was unveiled on August 15, 1938.

Trent Valley Canal, Bobcaygeon, Ont.—A cut stone monument with tablet was erected near the bridge over the canal to commemorate the construction, in 1833, of the first Bobcaygeon Lock by the Inland Water Commission, appointed by Sir John Colborne, the beginning of the improvement of the natural waterway connecting Lake Ontario with Georgian Bay.

First Cheese Factory in Canada, Ingersoll, Ont.—A tablet was affixed to the Post Office building to mark the site of the first cheese factory in Canada, established in the County of Oxford in 1864. The widespread adoption of the co-operative factory system in this and other counties marked the beginning of the modern dairying industry in Eastern Canada.

Sir Arthur Currie, Sir George Ross, and the Hon. Edward Blake, London, Ont.—Bronze plates in memory of each of these outstanding persons were erected in the Court House. The unveiling ceremonies were held on November 21, 1938, under the auspices of the London and Middlesex Historical Society.

Battle of Lundy's Lane, Niagara Falls, Ont.—Three tablets bearing the names of the officers and men who were killed in this battle, which took place on July 25, 1814, were attached to the large monument erected some years ago by the Dominion Government.

First Oil Wells in Canada, Oil Springs, Ont.—A tablet was affixed to the outer wall of Community Hall to commemorate the discovery of oil in this locality. It was observed by early travellers and by the pioneer farmers who used it for medicinal purposes. In 1858, near Oil Springs, James M. Williams dug the first oil well in Canada and later established a refinery at Hamilton. In 1861, John Shaw, by drilling into the rock, opened the first flowing well, its situation being lot 18, concession 2, Enniskillen Township. From these beginnings developed one of Canada's most important industries. The tablet was unveiled on July 1, 1938.

Samuel Hearne, Churchill, Man.—A table was affixed to the outer wall of Fort Prince of Wales to commemorate the public services of Samuel Hearne, 1745-92. Travelling overland from Port Churchill in 1771 he succeeded, after two attempts, in discovering the Coppermine River. He became governor of Fort Prince of Wales in 1775 and was in charge in 1782 when it was captured by La Perouse.

Cumberland House, Cumberland Lake, Sask.—A cairn with tablet was erected near the Hudson's Bay Company post to mark the site of this important trading house. From 1670 to 1774 all the posts of the Hudson's Bay Company were on the shore of Hudson Bay; but in 1774, as a result of the advent of the Montreal traders, the company built its first inland post, Cumberland House. Its erection marked a new era in the fur trade and the commencement of the rivalry which continued until 1821.

Fort Assiniboine, near Barrhead, Alta.—A cairn with tablet was erected in the southwest quarter of section 1, township 62, range 6, west of the Fifth Meridian, to commemorate the improvement in the early transportation system of Western Canada. In 1825 the old route across the continent by way of the Churchill, Beaver, and Athabaska Rivers was changed to one by way of the North Saskatchewan as far as Edmonton, and thence by pack-train to the Athabaska at Fort Assiniboine. This change resulted in greater speed, decreased cost, and increased safety.

Kootenae House, near Invermere, B.C.—A cut-stone monument with tablet was erected on Lot 375, Kootenay District, to mark the place where in August, 1807, David Thompson of the North West Company built Kootenae House, the first trading post of the white man on the Columbia River or its tributaries.

The Canadian Pacific Railway, Port Moody, B.C.—A cairn with tablet was erected on the City Hall grounds to commemorate the completion of the Canadian Pacific Railway. The " Last Spike " of this railway was driven November 7, 1885, and on the following day the first transcontinental train reached the terminus at Port Moody. On July 4, 1886, the first regular passenger train arrived at Port Moody from Montreal, thus completing the bond of union and making Canada independent in the matter of railway transportation. The monument was unveiled on October 1, 1938.

Preservation and Development Work

Preservation and development work was carried out at the following larger sites:—

Fortress of Louisbourg, near Louisburg, N.S.—Situated three miles south of Louisburg, Cape Breton Island, and built by the French during the years 1720-40, the Fortress of Louisbourg was the scene of great struggles between the French and English. It has an area of 328 acres and was acquired in 1928. During the past year excavation of the walls and moat at the Governor's Quarters in the Citadel was continued from where work was left off in 1936. The walls were rebuilt in this area and a bridge was constructed across the moat at the main entrance to the King's Bastion. Three new concrete gun bases and gun carriages were constructed and cannon mounted in place. One large and two small anchors were placed on suitable concrete bases in front of the museum building. Repairs were made to the road, and the ditches and culverts cleaned out. The water supply line from the freshwater pond was completed, a pump-house erected and painted, and a pump pressure tank and intake installed. A distribution line was run to the basement of the museum building to provide a connection for the new toilets which have been installed there.

Prince of Wales Tower, Halifax, N.S.—It is situated in Point Pleasant Park and is the last of five such towers erected in Nova Scotia. It was acquired January 25, 1936, in view of its significance as a type of military architecture. During the past year the roof and parapet walls were waterproofed and outlet drains and chutes provided to carry the water clear of the outside walls of the tower.

Champlain's Habitation, Lower Granville, N.S.—Additional lands have been acquired and preliminary steps taken in regard to the proposed erection of a replica of the Habitation. The memorial cairn erected several years ago to mark this site has been taken down in order to make way for the new buildings.

Martello Tower, Saint John, N.B.—Situated on Lancaster Heights and built for the defence of Saint John during the War of 1812-14. The wooden roof of the tower was removed, waterproof concrete coping placed around the parapet wall and waterproofed concrete laid on the firing step and the deck of the roof. Two copper roof drains and chutes were installed. The stonework of the inside of the parapet wall and firing step was cleaned and the joints pointed with waterproof cement. A weatherproof vestibule was constructed at the head of the stairway leading to the roof and the treads of the stairway surfaced with concrete. The wooden steps leading to the main entrance were taken down, reset close to the outside wall, and a landing constructed at the doorway. Minor repairs were made to the pointing of the outside walls, and the vents through the basement walls were cleaned out and wire screens installed in them. The entrance road, parking lot and the area around the base of the tower was levelled and gravelled and all iron and woodwork in the building was painted.

Fort Chambly, Chambly, P.Q.—Situated about twenty miles southeast of Montreal, Fort Chambly was built of wood in 1665 as a defence post against the Iroquois. The fort was rebuilt of stone in 1709-11 to resist the advance of the British forces; was captured by United States troops in 1775, and the interior buildings were burned in 1776. It was restored in 1777 and abandoned in 1880. It has an area of 2½ acres and was acquired in 1921. During the past year a concrete retaining wall was constructed on the bed of the Richelieu River on the north side of the fort and the space between the wall and the fort filled in with stones laid to a uniform slope to form a rip-rap. The stone work of the north face of the boundary wall was flush pointed in cement mortar and rip-rap placed sloping back from the wall fronting the picnic grounds to prevent erosion during high water. The interior walls of the fort were pointed where necessary and a shelter was erected on the picnic grounds.

Fort Lennox, Ile-aux-Noix, P.Q.—Situated thirteen miles south of St. Johns in Richelieu River, it formed a gateway to Canada and an advance post against the Iroquois and other invaders. The island was fortified by the French

before 1759 and its defences were rebuilt by the British during the years 1812-27. It has an area of 150 acres and was acquired in 1921. During the past year a section of the floor on the second story of the Commissariat building was relaid and repairs made to the vaulting and walls. The interior walls of the second story of the guard-house were replastered and the roof of the men's barracks was painted. Sections of the kitchens and storehouses at the rear of the men's barracks were restored with concrete and a T-shaped floating dock was constructed and placed in position at the west boat landing.

Fort Wellington, Prescott, Ont.—This fort was constructed in 1812-13 as the main post for the defence of the communication between Kingston and Montreal. It has an area of 8½ acres and was acquired in 1923. Work of a general nature was carried out during the year on the buildings and grounds.

Murney Tower, Kingston, Ont.—Situated in Macdonald Park, it is one of four similar towers erected at Kingston by the Royal Engineers in 1840-6 for defence purposes. During the past year a new roof was put on this building.

Battlefield of Stoney Creek Monument near Hamilton, Ont.—A frame with heavy grille was installed at the landing to the balcony of this imposing monument, all loose plaster removed from the walls and ceilings of the chamber at the base, and replaced with cement mortar. The heavy cornice of the monument was pointed, all broken glass replaced in the windows and repairs made to the window sills and frames.

Fort Malden, Amherstburg, Ont.—Built in 1797-9 by the Second Battalion, Royal Canadian Volunteers, under Captain Hector Maclean. In 1812 it was the principal military station on the western frontier. During the past year a contract was placed for the building of a museum and excavation work was subsequently commenced .

Fort Langley, Langley, B.C.—The first trading post on the Pacific Coast, it was built by the Hudson's Bay Company in 1827 and later destroyed by fire. It was rebuilt in 1840 and is to-day in a good state of preservation. During the past year the entrance road leading to the fort was graded and levelled, a cement curb constructed around the grass plot at the door and improvements were made to the grounds in front of the building.

Prince of Wales Battery, Charlottetown, P.E.I.—Under the supervision of officials of the City of Charlottetown, restoration and improvement work was carried out on the site of this battery, which is located in Victoria Park.

Restoration Work at Halifax, N.S., Quebec, P.Q., and Levis, P.Q.—Under the supervision of officials of the Department of National Defence considerable restoration work was undertaken at the Citadel, Halifax, N.S., the Quebec walls and fortifications (including St. John's Gate), Quebec City, and at Fort Levis, Levis, P.Q.

Principal work done at Halifax Citadel during the fiscal year 1938-9 consisted of reconstruction of the roads to Citadel Hill and the circular drive around the fortifications. Other work involved minor repairs to walls but no actual restoration was possible with the funds available.

Substantial progress was made with the work of restoration of the walls at Quebec Citadel which comprised in large measure the re-setting of the stonework. The St. John's Gate was completely rebuilt during the year and a certain amount of work also was done to improve the motor drives on the grounds outside the fortifications.

The fortifications at Levis are composed of three forts all more or less constructed on the same plan. Work during the year centred principally on Fort No. 1. This work consisted of reconstruction and repointing the walls and

making necessary repairs on the old earthworks. At Fort No. 2—the central unit of the fortifications—work was confined to minor repairs to the walls, rebuilding the original chimneys of the building inside the fort which is now used as caretaker's quarters, and installing fixtures in same to provide ventilation to the casemates.

Old Barracks, Carillon, P.Q.—Extensive renovation work was carried out and the building is now being used by the Historical Society of Argenteuil County for museum purposes.

La Verendrye Monument, St. Boniface, Man.—A grant of $5,000 was made to the La Verendrye Bi-Centenary Committee of Winnipeg to assist in the erection of a monument to the famous explorer Pierre Gaultier de Varennes, Sieur de la Verendrye. The monument was unveiled on September 11, 1938.

MIGRATORY BIRDS CONVENTION ACT

Responsibility for the administration of the Act based on the Migratory Birds Treaty which provides for the better protection of birds that migrate between Canada and the United States rests with the National Parks Bureau. Regulations covering the shooting of migratory birds remained practically the same with a continuation of the restrictions first imposed in 1936. A few alterations of a minor nature only were made with the concurrence of the provinces concerned.

MIGRATORY BIRDS CONVENTION ACT

(Chapter 130, Revised Statutes of Canada, 1927, and amendments)

On August 16, 1916, a treaty for the better protection of birds that migrate between Canada and the United States was signed at Washington, D.C. This treaty was made effective by Act of the Parliament of Canada in 1917.

The Minister is responsible to Parliament for fulfilment of Canada's obligations under the Treaty; under the Director of the Lands, Parks and Forests Branch, the Controller of National Parks is responsible for the administration of the statute, and the Superintendent of Wild Life Protection is technical adviser and executive assistant.

By virtue of Order in Council, P.C. 2283, of October 14, 1932, responsibility for police work pertaining to the enforcement of the provisions of the Migratory Birds Convention Act and Regulations made thereunder, was transferred to the Royal Canadian Mounted Police; all other powers and responsibilities continuing to remain with the Department of Mines and Resources.

Protection of Migratory Birds

The numbers of wild ducks and geese have been greatly depleted of recent years chiefly owing to drought conditions, drainage caused by advance of agriculture, outbreaks of duck sickness, and changes in environment in the southern Prairie Provinces. This area is the most important breeding grounds, at least for many species of ducks, in North America, and it is gratifying that the picture for 1938 appeared less depressing than in any of the past ten years. It is the hope of conservationists that the long drought cycle is at last broken and that the future holds a brighter waterfowl outlook in this important duck nesting area. However even with a great increase of precipitation, years may pass before a beneficial effect is seen on the waterfowl supply of the continent. Water conservation work under the authority of the Prairie Farm Rehabilitation Act and by private interests has undoubtedly tended to improve waterfowl nesting conditions, and these efforts will be increasingly beneficial as the work is extended.

In the main, other parts of Canada showed some improvement over 1937 in the matter of waterfowl supply. However, the southward migration of Atlantic brant was dangerously low in the Maritimes, and wild geese did not make as good a showing in Ontario and Quebec in 1938 as did ducks, a notable decrease of blue and snow geese during autumn being caused apparently by

the failure of these birds to rear many young on their Arctic nesting grounds. Since no other seriously adverse conditions respecting waterfowl in the Northwest Territories were apparent in 1938, it seems reasonable to assume that this area otherwise maintained its usually satisfactory waterfowl population. British Columbia showed a general improvement over 1937.

The 1937 hunting season of approximately two months for ducks and geese in Canada was continued in 1938, with only a few minor adjustments, this relatively short season having been adopted in 1936 in an effort to restore the losses in the natural supply of migratory waterfowl of the continent. A strict daily and seasonal bag limit was imposed, the use of live decoys in hunting these birds continued barred, and prohibition of baiting waterfowl with grain remained in force. Continuing the policy of recent years, no open season was provided for wood ducks, and no hunting of Atlantic brant was permitted. Sale of waterfowl was prohibited except in the far north where special conditions prevail.

The Migratory Birds Regulations are adjusted annually by the Federal authorities in collaboration with the provincial game administrations. All of the provinces co-operated in the enforcement of this law and thus helped to conserve a national resource.

Restrictions on hunting waterfowl in the United States remained far more stringent than in Canada. Only a one-and-one-half months' open season was permitted in the United States, the season was completely closed for several species, and the hours of shooting, possession limits, and the like continued to be kept to the minimum.

Undoubtedly the reduced hunting of waterfowl in both Canada and the United States has tended to increase their numbers to some extent, but a continuation of the strictest possible hunting regulations is necessary if the waterfowl population is to be built up to where it was some twenty years ago, so great has been the depletion. Provision of bird sanctuaries and establishment of suitable water habitat for these birds are absolutely necessary, and these phases of bird protection and restoration work are being given close attention.

Many other kinds of migratory birds besides waterfowl are included within the protective terms of the Migratory Birds Convention Act. The public is kept informed of the economic value of these birds and adequate measures for their safeguard are being taken. The birds included in the terms of the migratory birds law of Canada, other than waterfowl, have not, except in the case of a few species, been faced with any serious threat of depletion and seem to be maintaining normal abundance. It is evident that the public is appreciative of Canada's wild birds and shows ever-increasing willingness to co-operate in conserving them both for economic reasons and on account of the aesthetic interest they arouse.

A total of 52 Dominion bird sanctuaries of various types are now reserved under the Migratory Birds Convention Act in Canada. The following new sanctuaries were established during the period covered by this report:—Dorval Island in the Province of Quebec, and Hannah Bay in the Northwest Territories, the latter being of great importance as a waterfowl refuge. Seal, Flat, Round, Mud, and Noddy Islands, formerly a Nova Scotia bird sanctuary, were disestablished as such.

As usual, the National Parks Bureau received the voluntary co-operation of Honorary Game Officers under the Migratory Birds Convention Act. There are 797 such officers throughout the Dominion, and a great deal of valuable educational work is performed by them.

The four District Migratory Bird Officers operating under the direction of the National Parks Bureau continued with the field administration of the Migratory Birds Convention Act. In addition to their regular work covering a wide variety of duties connected with the administration of bird protection, they co-operated with the Royal Canadian Mounted Police respecting law

enforcement matters, educational work, scientific study of the relation of mergansers to fishing interests on the Pacific Coast, and life history studies of other species in British Columbia. Conditions in the important prairie duck nesting area were studied closely; also inspections of bird sanctuaries and other reserves were continued. The regular annual patrol of important breeding areas on the north shore of the Gulf of St. Lawrence was completed and conditions affecting bird life in the Maritime Provinces were closely observed and necessary action taken as required. Attention was given to lecturing on the value of native wild birds and their conservation, and close co-operation with the provincial governments, game conservation societies, and other organizations in matters pertaining to bird conservation work was continued successfully.

The co-operative plan for the development of an eider-down industry on the north shore of the Gulf of St. Lawrence has continued between the Quebec Departments of Lands and Forests, and Game and Fisheries, and the migratory birds protection service of the National Parks Bureau. Twenty-three leases were in effect in the season of 1938. In addition to preventing waste of a useful natural resource and providing a source of revenue to people whose possible sources of income are limited, the inauguration of this industry has advanced the conservation of the American eider duck in the areas involved. Lessees in these eider-down producing areas protect the eider ducks from poachers and attract as many eiders as possible to nest on their leases, thus increasing measures for conserving this species.

Bird banding is a world-wide investigation of wild bird life and is being conducted in most of the important countries of North America and Asia, and in more than twenty countries of Europe. In North America the bird-banding project involves the fullest co-operation between the National Parks Bureau at Ottawa, and the United States Bureau of Biological Survey at Washington, D.C. This has proved to be a most satisfactory arrangement in view of the highly migratory habits of most species of North American wild birds which range freely over the continent and regularly migrate from one country to the other.

Practically all bird-banding operations in Canada are conducted by some 200 voluntary co-operators who are required to have a special knowledge of ornithology and are authorized to do the work by special bird-banding permits under the Migratory Birds Convention Act. The wild life unit of the National Parks Bureau has custody of all bird-banding data which relate to Canada.

During the calendar year 1938, 32,226 birds were banded in Canada, and 815 records of banded birds that have been captured, killed or found dead, were added to the rapidly accumulating mass of new and useful data now available for study by officials and organizations concerned with problems in the conservation of wild bird life.

Bird banding is the only means of completely solving such problems as summer and winter ranges, migration routes or fly-ways, concentration points, mortality rate, percentage of the take of game birds, fluctuations in abundance, longevity, and kindred subjects.

This effort has continued to expand and progress in Canada and at least four times the volume of bird-banding data is now being recorded as compared with ten years ago. The success of the work is largely dependent on the voluntary co-operation of the public in reporting any banded birds they may recover to the Controller, National Parks Bureau, Ottawa, who will advise the persons making the reports as to the complete banding histories of the birds involved.

The supply of eel-grass, a very important natural source of food for waterfowl on the Atlantic Coast in Canada, remained far below normal, and there was no improvement over the greater part of the area which formerly produced this important marine plant in great abundance. It has, however, come back to some extent in patches, fairly substantially in some localities, and this relatively slight improvement may be permanent in a few scattered places. No trace of

eel-grass can be found in many places where it formerly grew in thick beds prior to the blight which attacked this plant some years ago, and many areas of this kind are now covered with drifting sand. While there is no real certainty, reports give at least some hope that eel-grass will recover possibly a fraction of its former abundance.

Permits and licences issued under the Migratory Birds Convention Act, and valid during the year 1938 were as follows:

366 permits to collect specimens of migratory birds for scientific purposes.
200 permits for banding purposes.
112 permits allowing the destruction of certain birds when found injuring agricultural or fishery interests.
576 permits to possess birds for propagating purposes in the various provinces.
6 permits to take birds for propagating purposes in the various provinces.
23 permits allowing the collecting of eider-down.
52 permits to collect gulls' eggs in Saguenay County, P.Q.
5 permits to collect gulls' eggs on bird sanctuaries.
5 permits to possess firearms on bird sanctuaries.
10 permits to destroy herring gulls.
58 taxidermist's licences.

The following printed material was distributed during the year: Consolidations of the Migratory Birds Convention Act and Regulations, 6,048; abstracts of the Act, 19,557; posters, 48,440; pamphlets, 33,282; slides lent, 3,145.

Two hundred and five lectures were given by officers of the Bureau, and lecture material, including motion pictures and lantern slides, was lent freely to voluntary assistants.

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

The Summer Session of the American Association for the Advancement of Science, Ottawa, Ont., June-July, 1938.

The Fifty-sixth Stated Meeting of the American Ornithologists' Union, Washington, D.C., October, 1938.

The Fourth North American Wildlife Conference, Detroit, Michigan, February, 1939.

A conference of Provincial and Dominion game officials met at Ottawa, January 16, 17, and 18, 1939, and it is felt that this conference between Provincial and all Dominion Departments concerned with wild life conservation accomplished a great deal in promoting understanding of wild life problems. Because of these conferences important advances have been made toward the development of a national wild life policy for Canada.

Some fifteen resolutions were adopted and these relate to various conservation items as follows: a revision of the regulation prohibiting baiting; collection of birds for scientific purposes; an annual stamp tax on hunters of migratory game birds, the proceeds to be used for conservation purposes; prohibition of the use of the pump shotgun that has not been plugged to hold only one shell in the magazine; early adoption of Migratory Birds Regulations each year; uniform bag limits upon game birds; definition of "hunt" in the Migratory Bird Regulations; publicity pictures of hawks and owls with summaries of their economic status for educational purposes; restriction of the open season for eider ducks to two months; prohibition of a rifle or a shotgun loaded with a single bullet in hunting migratory game birds. Resolutions were also adopted approving, in principle, a Dominion Act in aid of provincial legislation to cope with illicit movement of wild life products from province to province; and dealing with research in connection with Canada's wild life resources. Although proceedings of the conference are not available to the public, copies of the resolutions passed by the conference are supplied on request.

Mr. Charles Elton, Director of the Bureau of Animal Population, Oxford University, Oxford, England, continued studies concerning the fluctuations in the population of the northern varying hare or snowshoe rabbit. Cycles of abundance and scarcity of this very important species have a pronounced effect on the status of other forms of wild life, and therefore take a prominent place in the economic structure of natural resources such as food and fur supply. The facts are gathered in Canada by the National Parks Bureau with the help of hundreds of voluntary observers, analysis of the data obtained in this way is made at Oxford, and the results are published in Canada.

The Royal Canadian Mounted Police continued co-operation in the enforcement of the law relating to the application of the Migratory Birds Convention Act. As usual, the force also assisted greatly in gathering reports concerning wild life in Canada, principally data on the abundance or scarcity of waterfowl, and in obtaining and reporting details of the recovery of many banded birds.

Mammal conservation work and kindred subjects in the National Parks, as well as in the Northwest Territories, was continued by the scientist employed for this purpose during the previous year. This work is expanding and progressing favourably and will help to solve many wild life problems.

Advisory Board on Wild Life Protection

Four meetings of the Board were held as follows: November 1 and 29, 1938; January 9, and March 31, 1939. A few of the subjects dealt with were collection of eider-down on Baffin Island and circumstances attending this activity; regulations, licences, game conditions of the Northwest Territories; Hannah Bay Bird Sanctuary, Northwest Territories; proposals for studying fluctuations in the populations of wild animals made by Mr. Charles Elton on the occasion of his recent visit to Ottawa; Akimiski Island, Twin Islands, Northwest Territories, and other areas proposed as wild life sanctuaries.

Changes in the personnel of the Board were as follows: D. J. Allan, Superintendent of Reserves and Trusts of the Indian Affairs Branch, and Dr. C. H. D. Clarke, mammalogist, Lands, Parks and Forest Branch, both of the Department of Mines and Resources, were appointed members of the Board.

APPENDIX

The Alpine Club of Canada

(From the Report of the Chairman of the Club-House Committee)

The club-house at Banff opened for the season on June 29, 1938. Attendance during July was very poor, but picked up in August, with a total registration during the season of 221. Provinces and countries represented were as follows:—

British Columbia	19	United States	75
Alberta	61	Scotland	6
Saskatchewan	5	England	21
Manitoba	7	Wales	1
Ontario	12	New Zealand	1
Quebec	10	Hawaii	1
France	2		

(General Report compiled from the Gazette of the Alpine Club)

The thirty-third annual camp was held from July 16 to 31, near the foot of the Athabaska Glacier, in Jasper National Park, and opened up new climbing possibilities for members and their friends. One advantage of this camp was that members and their friends could avail themselves of motor transport direct to camp, instead of having to use the old pack-train.

A total of 160 persons, including the staff, were placed under canvas, representatives attending from the Alpine Clubs of England, America, France, Switzerland, and Mexico; the Ladies Alpine Club, the Ladies Scottish Climbing Club, the Royal Geographical Society, the Appalachian Mountain Club, B.C. Mountaineering Club, the Colorado Mountain Club, the Mazamas, the Mountaineers, the Sierra Club, the Obsidians, and the Yale Outing Club.

High-camp equipment was again in great demand, and this camp, pitched on the shoulder of Snow Dome at about 10,000 feet, provided some 50 people with the novel experience of sleeping and catering for themselves on the snowfields. From here climbs were made of Columbia, North and South Twins, and Snow Dome. A fly camp was also placed at the foot of the Saskatchewan Glacier to which several members went. The annual meeting of the Club was held at the Columbia Icefield Camp, July 27, 1938.

DOMINION FOREST SERVICE

The Dominion Forest Service is maintained to further the protection, maximum production, and wise use of Canadian forest resources. It operates forest experiment stations to obtain basic knowledge of the best methods of managing woodlands and afforestation of waste lands, and forest products laboratories to aid in securing more efficient utilization. Research in forest-fire hazards facilitates protection, and special studies in interpretation of aerial photographs give valuable data for the stock-taking of our forest estate. Statistics of forest production and trade are analysed, market trends are noted, and the information derived is made available through publications issued. These activities are a Dominion contribution to forest conservation. They supplement the activities of the provinces, which, as the owners of the forests within their boundaries, are mainly responsible for forest administration in Canada.

The use value of our forests is not confined to the raw materials produced. Many indirect benefits accrue. With the rise of the tourist industry to a position of high importance, the recreational values of our woodlands must be given more intensive study. The Dominion Forest Service is playing its part in the development of the multiple-use policy as applied to the forest estate. In the national parks, for instance, special operations, termed "sanitation cuttings," are supervised by the Forest Service. The purpose of these cuttings is the improvement of the health and growing conditions of timber stands along main park highways, whose attractiveness to visitors will thereby be increased.

The national parks present also exceptional facilities for study of variations in the balance of wild life. Increase of herbivorous animals following destruction of predators, unless subject to planned control, may have harmful effects on forest growth.

The Dominion Forest Service also serves other branches and departments of the government service in a technical or advisory capacity. Timber-disposal policy on Indian reserves, military reservations, and Dominion lands in the Northwest Territories is reviewed, and sales are supervised and inspected on request.

A joint investigation of much promise is the tree-breeding and propagation study being conducted at the Petawawa forest experiment station in co-operation with the National Research Council. This work, organized under a special subcommittee of the Associate Committee on Forestry of the Council, may produce new knowledge which will lead to a revised technique in forest management. While the study is still in the preliminary stages, the possibilities of development are very interesting.

Special reference should be made to the provision of additional funds under Vote 535 of the special supplementary estimates for the improvement of protection and administrative facilities, and the conduct of silvicultural operations at forest experiment stations.

The $200,000 thus made available enabled the Forest Service to complete a large amount of road and building construction and to conduct for the first time in Canada large-scale experiments on the economic feasibility of various methods of improvement cuttings and thinnings in second growth stands.

FOREST ECONOMICS

The Division of Forest Economics assembles and compiles all available information as to the forest resources of the Dominion, the depletion of these resources due to cutting, fire, and other causes, the production of the industries dependent on the forests for raw material, and the trade in forest products.

Forest Resources

The Forest Service has completed inventories of the forest resources in Manitoba and New Brunswick, and, though the inventories of Saskatchewan and Alberta are incomplete, a sufficient quantity of data has been collected to enable a preliminary estimate to be made. Reports on these surveys have been issued in Bulletin 85, "The Forests of Manitoba"; Bulletin 91, "The Forests of New Brunswick," and Bulletin 88, "Forests and Forest Industries of the Prairie Provinces." The Service is co-operating with the Province of Nova Scotia in a survey of its forests based primarily on information secured by aerial photography. The other provinces supply the latest data available. Since new surveys are being conducted each year, and the forests are constantly changing because of depletion and growth, it is necessary to revise the National Inventory from time to time. The latest compilation was published in Bulletin 92, "Economic Aspects of the Forests and Forest Industries of Canada, 1938."

This showed the forested area to be 1,223,522 square miles, 35·3 per cent of the total land area, as compared with 6 per cent which is under cultivation and pasture. Approximately 769,500 square miles are classified as accessible and productive forests; on 360,500 square miles of this area the timber is of merchantable size, and on the remaining 409,000 square miles there is young growth of various ages to supply future requirements.

The total stand of timber of merchantable size is estimated to contain 273,656 million cubic feet, of which 170,144 million cubic feet is considered accessible under present conditions. The accessible timber consists of 245,313 million feet board measure of timber suitable for the manufacture of sawn lumber and 1,107 million cords of smaller material that could be used for pulpwood, fuel-wood, etc.

Conifers, or "softwoods," comprise 78 per cent of the merchantable timber, and broad-leaved, or "hardwood," species, 22 per cent.

Of the total forest area 91·5 per cent is Crown land, administered chiefly by the provincial governments. It is estimated that 15 per cent of the merchantable timber is on privately owned land and 40 per cent is held under cutting licences granted by the governments to companies and individuals.

The accessible timber is estimated to have a present or prospective stumpage value of about $2,000,000,000—merchantable timber $1,597,000,000, and young growth $403,000,000.

Depletion

The average annual depletion of the forests during the ten years 1928-37 is estimated to amount to the equivalent of 3,930 million cubic feet of standing timber, classified as follows:—

Cut for use	2,579	million cubic feet
Merchantable timber destroyed by fire	325	" " "
Young growth destroyed by fire	326	" " "
Losses due to insects, fungi, etc.	700	" " "
Total	3,930	" " "

During each of the last three years for which records are available (1936-8) the loss of merchantable timber and young growth due to fire has been equivalent to about 1,000 million cubic feet. Whether this increase in fire loss was due more to weather conditions or to laxity in fire prevention and protection is difficult to determine.

Increment

The extent to which the annual depletion is replaced by growth is unknown. A number of regional surveys has been made which indicate a satisfactory increment, but the data relating to the various forest sites and types are not sufficient to provide a reasonable basis for an estimate of the annual increment.

However, an annual depletion of 3,930 million cubic feet represents only about 8 cubic feet per acre on the 492,480,000 acres of productive forest land. The 2,579 million cubic feet of timber cut for domestic and industrial use make an average of only 5 cubic feet per acre. With proper protection and management this demand could be supplied indefinitely on one-fifth of the productive area in the Dominion, or one-half the productive area in the Province of Quebec.

Forest Industries

In 1937, the latest year for which statistics are available, the net value of production in the industries primarily dependent on wood was $386,690,450. This figure represents the difference between the gross value of the products manufactured and the cost of the raw materials and the electric power and fuel used.

These industries provided employment on a man-year basis to 209,217 people; but, owing to the seasonal nature of the work, especially in the woods operations and the lumber industry, it is estimated that about 365,000 persons secured a substantial amount of employment in these industries during the year. The salaries and wages paid amounted to $175,945,922, which comprises 45·5 per cent of the net value of the products.

Summary of Statistics of the Forest Industries, 1937

—	Number of Employees	Salaries and Wages	Value of Products added by Manufacture
		$	$
Woods operations	100,000	60,000,000	163,249,887
Lumber industry	33,917	27,173,872	46,727,302
Pulp and paper industry	32,101	48,757,795	106,013,221
Wood-using industries	31,677	27,054,807	43,657,874
Paper-using industries*	11,522	12,959,448	27,042,166
Total	209,217	175,945,922	386,690,450

*Exclusive of printing trades.

The number of men employed in woods operations is indicative of the activity of the industries using wood as a raw material. Logging operations were restricted in the winter of 1938-9 owing to a surplus of pulpwood and logs having resulted from abnormal activity during the previous winter and uncertainty as to the markets for pulp, paper, and lumber in the coming year. The average

index of employment in logging was only 142·8 in 1938 as compared with 189·3 in 1937. This represented a decrease of about 25,000 men in the average monthly employment as compared with 1937.

Lumber Industry

The lumber industry shows continued progress towards recovery from the depressed conditions of 1932, when the gross value of the products sank to approximately $38,500,000. In 1937 they were valued at $104,849,785 as compared with $80,343,291 in 1936—a gain of 30·5 per cent.

Pulp and Paper Industry

In 1937 the value of the products of the pulp and paper industry as marketed, including the pulpwood and pulp exported and the paper manufactured, was $229,789,483, as compared with $187,377,770 in 1936. These figures do not include a certain amount of pulp used in Canada for the manufacture of artificial silk, fibreware, and products other than paper; on the other hand, they do not include any duplication of values, and constitute a fair presentation of the net value of the industry in Canada.

The apparent total production of pulpwood in 1937 reached a record of 8,298,165 cords, an increase of 1,296,108 cords over the cut of 1936. Of the wood cut in Canada 1,705,031 cords were exported, chiefly to the United States, and 6,593,134 cords were used in Canadian mills; on the other hand, 20,505 cords were imported from the United States.

Trade in Forest Products

The exports of wood, wood products, and paper, exclusive of books and printed matter, were valued at $210,663,280 in 1938, as compared with $261,986,296 in 1937. The imports of these products were valued at $16,866,000 in 1938 and $19,509,990 in 1937; and the favourable balance of trade amounted to $193,797,280 in 1938 and $242,476,306 in 1937.

The recession in world economic conditions in 1938 was evidenced by a decrease of $51,323,016 in the value of the exports of forest products in 1938 as compared with 1937. Decreases were recorded in all classes of products except raw materials, where increased exports of pulpwood to Europe caused a slight gain.

EXPORTS OF WOOD, WOOD PRODUCTS AND PAPER

(Exclusive of books and printed matter)

—	Calendar Years	
	1937	1938
	$	$
Raw materials (logs, bolts, and pulpwood)	17,106,941	17,734,535
Products prepared in woods (poles, hewn ties, etc.)	3,517,643	2,055,620
Sawmill and planing-mill products (lumber, shingles, etc.)	58,885,801	47,380,549
Manufactured wood products (doors, furniture, etc.)	4,496,012	2,889,062
Pulp and paper and manufactures of these	177,979,899	140,603,514
Total	261,986,296	210,663,280

On the basis of value, the proportion of the exports of forest products going to British countries increased from 24·5 per cent in 1937 to 27·7 per cent in 1938. The United States continues to provide the largest market for these products.

PER CENT OF VALUE OF EXPORTS OF FOREST PRODUCTS TO THE PRINCIPAL IMPORTING COUNTRIES

	Calendar Years	
	1937	1938
United Kingdom	17·0	18·2
Australia	4·3	6·0
New Zealand	0·8	1·1
British South Africa	1·0	1·0
Other British possessions	1·4	1·4
Total British	24·5	27·7
United States	68·3	66·4
China	0·8	0·5
Japan	2·5	0·8
Argentina	1·0	0·8
Other foreign countries	2·9	3·8
Total Foreign	75·5	72·3

Aerial Forest Surveys

Continued progress has been made in the development of technique for the utilization of air photography for forest-survey purposes and in the practical application of the methods devised by the Division of Forest Economics.

During the fiscal year 1938-9, forest maps and volumetric estimates of the timber were made for 3,504 square miles as compared with 3,514 square miles during the preceding year. This included 1,410 square miles for the Saskatchewan forest inventory and 1,250 square miles for the inventory in Nova Scotia, including 390 square miles in the Cape Breton National Park. One-sixth of the area of Nova Scotia has now been covered. The forests on four Indian Reserves, totalling 179 square miles, were mapped and estimated for the Indian Affairs Branch, as were also 565 square miles of the Prince Albert National Park.

Timber estimates from air photographs were made of an area of 100 square miles in the Lièvre River watershed in Quebec as a demonstration of their value to industry in planning operations as well as for inventory purposes.

Through the co-operation with operating companies it has been possible to secure checks of air-photography estimates with intensive ground cruises and actual cuts. On an area of 280 square miles the air-photography estimate was 5 per cent greater than that of an intensive ground cruise and on another tract of 100 square miles it was 8 per cent greater than the actual amount cut. This degree of accuracy compares very favourably with ground surveys, since the degree of utilization is a factor which the estimator cannot determine.

The practicability of not only mapping the forest-type areas but of estimating the amount of timber without recourse to field work has now been demonstrated as far as purely inventory purposes are concerned. However, a limited amount of supplementary ground sampling is required to secure data as to the distribution of individual species, age, site, rate of growth, reproduction, defect, and other particulars, when such information is required for management purposes.

Co-operation with foresters in private employ has been secured to test the application of our methods to intensive volumetric timber estimating on relatively small areas, in order to show whether the degree of accuracy secured is sufficient for the exacting requirements of immediate logging operations.

It has been found that photographs taken in the winter, when the deciduous foliage is absent and there is snow on the ground, have distinct advantages over summer photographs for forest surveys. The development of colour photography promises to become a valuable aid in species identification, especially when the making of coloured prints on paper reaches an economically practicable stage. Significant advances have been made in improving photographic film and in the use of filters for the accentuation of the various colour tones in the forest cover.

A field investigation has shown that air photographs may be used to great advantage in site classification in conjunction with ground studies. The physiography as revealed under a stereoscope, together with the wealth of information in regard to the forest cover that may be obtained from the photographs, provides a means of extending intensive soil and ecological studies to adjacent areas.

Tuition in methods of forest interpretation has become an important feature of the work of the Division. During this fiscal year, foresters employed by five pulp and paper companies were detailed by these companies to the Forest Service for instruction for varying lengths of time, totalling about two months.

SILVICULTURAL RESEARCH

Silvicultural research is concerned with studies of methods of forest management to determine the method or methods likely to produce the most suitable forest crop in the shortest time, continuously and most economically, for each of the various conditions of soil and associations of tree species. Investigations of the extensive existing young stands, which must provide wood supplies in the near future, are the first consideration. Study of methods of cutting mature stands with a view to obtaining better growth, quality, and associations in the remaining stand, with satisfactory reproduction of desirable species, is second only in importance. Attention is also directed to the reforestation of waste lands, which in some sections of the country is a serious matter, affecting the control of drifting sands, regulation of stream flow, and prevention of erosion.

These problems involve studies of the more fundamental factors of soils, climate, and genetics. In addition, measurement units require the prosecution of mensuration studies. For the prosecution of these problems in silviculture, five forest experiment stations have been established, representing five different forest regions. In timber types and forest regions not represented on these stations, supplementary studies are conducted on selected provincial and privately owned lands in co-operation with the provincial authorities and the industries.

At the Petawawa (Ont.) station and at the Acadia (N. B.) station phenological records of the flowering and other activities of native trees, shrubs, and herbs were made. Meteorological records were also made, serving both silvicultural and fire-weather investigations.

A party of six men carried out an examination of certain cut-over and burned-over lands in northern Saskatchewan, for a study of growth and reproduction conditions; white spruce was the main species. More than 900 one-fifth-acre sample-plots were examined, and the data are now being analysed.

Following the reconnaissance survey of 1937, a field party collected data in balsam fir types of the upper Gatineau watershed in a search for some readily recognizable factor indicative of abnormal occurrence of rot in balsam fir. In this project the plant-pathology unit of the Dominion Department of Agriculture and the International Paper Company were co-operators. The data are now being analysed.

In 1914 the late Senator Edwards planted 16,000 red pine seedlings on farmlands at Rockland, Ontario. In co-operation with the present owner, Mr. S. H. Morris, this stand is being used for experimental purposes. It was moderately thinned and pruned so that the past rapid growth might be continued. Two permanent sample-plots were then established to record the development. Thinning reduced the stand from 900 to 600 trees per acre. At 27 years of age, the average diameter was 6·1 inches, the average height was 42 feet, and the total volume was 3,750 cubic feet per acre. The total cost of thinning was $231; the return for thinning of saw-material in thousand feet board measure and 75 cords of fuel-wood was $243, slightly more than the cost. A report of the project has been prepared for publication.

Research Notes.—The following research notes were issued in mimeographed form:

No. 54, Site as a Factor in Silviculture, by J. W. B. Sisam;
No. 55, Forest Development on the Goulais River Watershed, by J. W. B. Sisam;
No. 56, Forest Improvement Cuttings in Canada, by G. A. Mulloy.

The Science Service of the Dominion Department of Agriculture is co-operating with the Dominion Forest Service in problems relating to forest insects and forest-tree diseases. At the Petawawa station the Entomological Division and the forest-pathology unit of the Division of Botany have established offices and have representatives throughout the season, as does also the Division of Entomology at Fredericton. The work of the latter relates particularly to the spruce saw-fly.

Petawawa Forest Experiment Station

The Petawawa Forest Experiment Station, Renfrew County, Ontario, an area of nearly one hundred square miles, on the upper Ottawa River, represents the white and red pine cover-type, and its associate fire-type species, white birch and poplar, characteristic cover-types of the Algonquin-Laurentides section of the Great Lakes-St. Lawrence forest region. The stands are almost entirely second growth, approaching maturity, and therefore are particularly suitable for primary silvicultural research. There are also occasional areas of lowland black spruce, as well as areas of white spruce and balsam fir.

Improvement Cuttings.—A series of young, overstocked stands was improved by release and sanitation cuttings and by girdling; this was done by relief labour. The purpose was to investigate the economic possibilities of thus improving the composition and growth-rate of stands. Detailed records of costs under various methods were kept; the benefits of improvement will be recorded by means of repeated measurements of transect sample-plots. Four blocks of thirty to fifty acres each were fully improved, each by a different method, as follows:—

Block 1.—All overtopping hardwoods, together with conifers of poor form, cut and utilized as sawlogs and fuel-wood; net cost, $15.95 per acre.

Block 2.—The sawlog material and only the best fuel-wood trees cut; the remainder of the overtopping and defective trees girdled; net cost, $20.70 per acre.

Block 3.—Stems hauled to the roadside and bucked into fuel-wood; net cost, $8.30 per acre.

Block 4.—Sawlogs only taken; all other defective and suppressing material girdled; net cost, $9.95 per acre.

In each block, 200 white pine trees per acre were pruned for one log-length at a cost of $4.70 per acre. The cost of girdling was $1.60 per hundred trees.

The results given above indicate that the more intensive treatments cannot be considered as economically feasible under present operating and market conditions. In view, however, of the greatly enhanced value of clear stock white pine (a spread of around $50 per thousand feet board measure above common grades), it may be well worth while to spend up to $5 per acre on pruning, and to girdle hardwoods interfering with the growth of final-crop trees.

Sample-plots.—A series of transect sample-plots was established in black spruce stands cut over under permit by various silvicultural methods; these represent three distinct site-types. All plantation areas were surveyed and remeasured, and the results have been analysed. Twenty-one permanent and transect sample-plots established at various dates since 1918 were remeasured; these represent thinning studies and reproduction studies following commercial cutting operations.

Other Work.—Extensive studies on the relative value of native and exotic species and in tree breeding and hybridization to improve desirable characteristics of pine, spruce, poplar, and basswood were continued; in these projects the National Research Council is co-operating. A comprehensive study of method and time of disposing of spruce slash to obtain maximum reproduction with minimum of fire-hazard is progressing. Throughout the growing season systematic records were taken of the development of flowers, leaves, buds, and fruits of representative plants, shrubs, and trees.

Throughout the year meteorological records were taken twice daily; these records supply silvical data as well as basic data for fire-hazard research. Nearly 5,000 cords of wood were removed in the prosecution of silvicultural cutting plans, which provided employment for sixty permittees and their labourers. The working-plan budget allows an annual cut up to 6,000 cords. Thirty miles of base line and tie lines were run and established by iron posts at twenty-chain intervals, completing the boundary and grid system for the station. Four miles of primary gravel road were constructed; and all tree-line telephone lines (twenty miles) were replaced by pole-line, metallic circuit.

The forestry and allied sections of the American Association for the Advancement of Science, comprising over 150 members, at a two-day session at the station (June 30 and July 1) reviewed the research projects under way there.

Activity in timber disposal for the year was high, the amount of timber removed almost reaching the allowable cut of 6,000 cords.

A total of 198 timber permits was issued, on which 336,000 feet board measure of sawlogs, 45,000 linear feet of telephone poles, and 3,500 cords of pulpwood and fuel-wood were cut. In addition, 146,000 feet board measure of sawlogs and 1,100 cords of fuel-wood were taken out as improvement cuttings, and 250,000 feet board measure of hemlock were removed for station requirements.

The stumpage return obtained through permits was $4,185. The value of the material used at the station, that used by the Department of National Defence, and that still undisposed of at the end of the fiscal year amounted to an additional $1,900.

Acadia Forest Experiment Station

The Acadia Forest Experiment Station is filling a long-felt need for an area in the Maritime Provinces under Dominion Government control on which forest investigations may be carried out. The work of the station itself comprised investigations in nursery work and planting; in thinning and other cultural methods; in utilization; in phenological, entomological, and fire-weather studies, and in short popular courses in forestry. Co-operative studies were made with the New Brunswick Forest Service and with private concerns in silvicultural research, (thinning, girdling, and cutting), and with the Entomological Division of the Science Service of the Dominion Department of Agriculture in the use of parasites for controlling the spruce saw-fly (including the setting aside of an area for the permanent use of the entomologists in carrying on their studies).

Nursery investigations included the study of exotic coniferous species—to discover their adaptability to Eastern Canada, and to compare their growth with the native species—and of nursery and planting technique. The planting program carried out mainly along investigative lines, included (1) insect-control studies, (2) mortality studies, (3) underplanting for type conversion, and (4) species investigations.

Examination was made of twenty-four permanent sample-plots that had been established for the study of sucker and sprout control from which intolerant hardwoods had been cut, and of the permanent sample-plots established for the study of planting technique, and also for the study of the possibilities of direct seeding.

Because of the growing feeling that the future forest will depend on the young stands at present established, extensive work was carried out in an endeavour to solve some of the problems regarding the handling of young stands and to obtain information that might determine the minimum amount that could be spent per acre to give the most satisfactory growth and the greatest financial returns. The areas investigated are to be of a permanent nature, and detailed information was collected through the use of transect plots from which the final results of the investigation will be compiled. Treatments included the felling of large trees to release conifers, the removal of dead and defective trees from a pure hardwood stand, heavy thinning of hardwod stands in order to release conifers and augment the growth of the remaining stand, and clear-cutting. Costs of the various treatments ranged from $1.40 to $8 per acre. Approximately 370 acres were treated in these investigations. This program occupied most of the time of the staff.

Short Courses in Forestry.—During the season 1938-9 a six-weeks' course in practical forestry was given to groups of young men from each of the Maritime Provinces. The demand for these courses is continuing, and requests have been received for the complete possible time that can be utilized for this work during the coming autumn and winter. The work of the school covers the practical handling of the farm woodlot. Only sufficient theory is given to maintain the interest of the students.

Some distribution of surplus planting stock was made in response to requests received from all parts of the Maritime Provinces.

Valcartier Forest Experiment Station

The Valcartier Forest Experiment Station, area 7½ square miles, situated 17 miles northwest of Quebec city, is on the border between the northeastern coniferous section of the Boreal Forest Region and the Algonquin-Laurentides Section of the Great Lakes–St. Lawrence Region. The major cover-type is tolerant hardwood—yellow birch and maple—but black and red spruce, balsam fir, and white birch cover-types are also represented. The working plan provides for the cutting of 600 cords of tolerant hardwoods annually, for which a regular market has been arranged; trees for removal are being marked for light and heavy selection cutting, and for clear-cutting in strips. Salvaging operations were conducted in coniferous stands recently damaged by windfall. A series of ten permanent sample-plots and six transect sample-plots was established this year in areas cut over selectively in 1936. An examination of the station revealed that white pine blister rust is likely to cause damage to white pine plantations, indicating the need for protective measures. Nearly two miles of secondary road were constructed into the hardwood stands to facilitate utilization of wood products, and to improve fire protection. A section of the main trunk road was gravelled.

At the request of a large lumber firm, and with the approval of the Quebec Forest Service, a preliminary examination was made of certain limits in the Rimouski district with a view to preparing a working plan to provide a continuous supply of spruce for the sawmills.

Kananaskis Forest Experiment Station

The Kananaskis Forest Experiment Station, representing the subalpine forest region of the east slope of the Rockies, is characterized by lodgepole pine forests with, in many places, an understory of Engelmann or Alberta spruce. Douglas fir also occurs in pure stands or in mixture with spruce and pine. The purpose of the station is to investigate the growth and development of these species.

Since the inception of the station in the late autumn of 1934, considerable progress has been made in the construction of improvements necessary for protection from fire, for administration, and for the silvicultural development of the area.

The working-plan survey has now covered approximately 18½ square miles of the more accessible part of the area, of which about 8 square miles was completed this year. The detailed topographical and timber-cover maps of the part of the area thus covered have now been completed, and the volumetric data partially compiled.

The research staff, continuing the study of thinning methods started last season, have laid out during the past year nine carefully selected plots of three acres each, in which it is proposed to study the effect of three methods of thinning, namely (1) the French method of thinning from below; (2) the German method of thinning from above, and (3) the experience method of selecting final-crop trees. One plot heavily thinned, one lightly thinned, and one control were prepared for each method—nine plots in all. The compilation of the data is largely completed.

Cultural treatment of stands on an extensive scale, started in 1934 by unemployed relief crews, was carried on again this year, some 160 acres of young stands having been thinned. In a stand of 45-year-old lodgepole pine a thinning by the experience method—200 trees being selected per acre for the final crop—was carried out on 141 acres at an average cost of $5.20 per acre. Sixteen control plots of one-tenth acre each were established at regular intervals throughout the area, so that the improvement to the stand may be easily and accurately assessed in the future. In addition to this operation, a 70-year-old stand was heavily thinned by the German method, and sufficient material secured, although not yet sold, to recover most of the cost of the operation.

A logging operation was carried out in 26½ acres of overmature spruce and pine, which netted 248,000 feet board measure in the form of logs suitable for sawing into lumber. This operation was undertaken for the purpose of creating conditions similar to those left in ordinary commercial operations so that the effect of such cuttings may be studied in detail. The selection method of cutting was used, and there remains on the area a fairly good stand of spruce from which it is expected another cut can be made in fifteen to twenty years. The cost of this operation will be fully covered by the sale of the logs.

FORESTRY WORK IN NATIONAL PARKS

Riding Mountain National Park

The forests of the Riding Mountain National Park, approximately 1,200 square miles, 200 miles northwest of Winnipeg, represent the mixedwood section of the Boreal Forest Region of Canada. An aerial survey working-plan made in 1937, supplemented by ground survey, shows the distribution of cover-types to be as follows:—

	Acres	Per Cent
Hardwood: Merchantable	332,000	43·5
Small-growth	94,000	12·4
Sub-total	426,000	55·9
Mixedwood: Merchantable	90,000	11·7
Small-growth	17,000	2·2
Sub-total	107,000	13·9
Softwood: Merchantable	33,000	4·3
Small-growth	12,000	1·6
Sub-total	45,000	5·9
Recent burn	46,000	6·0
Muskeg	15,000	1·9
Non-forested	98,000	12·8
Water	28,000	3·6
Total	765,000	100·0

The annual cutting budget, tentative until the working plan is completed, is 2·5 million feet board measure, which is being removed by selection system under permit to settlers. Sanitation cuttings, consisting of the removal of dead and down material, thinning of dense stands, and pruning of dead limbs for a height of ten feet, were made along each side of the main roads; approximately 4,000 cords of fuel-wood from 1,450 acres were thus obtained. A series of six steel lookout towers to form a fire-protection network was erected; in addition, two wooden towers were constructed on two of the main roadways to provide views for tourists as well as for protection purposes. All towers were connected by new or reconditioned telephone lines; this project required the reconditioning of 100 miles of ground-circuit line and the construction of 43 miles of new ground-circuit line and also 3 miles of new metallic-circuit line. For protection and utilization purposes, 26 miles of new roads were constructed, and 10 miles of old roads were improved. Eight buildings were erected to house patrolmen and tower observers.

Prince Albert National Park

The Prince Albert National Park, nearly 1,900 square miles in area, about 35 miles north of Prince Albert, Saskatchewan, is in the mixedwood section of the Boreal Forest Region similar to the section in which the Riding Mountain Park is located. Except for sanitation cuttings along main highways, covering 350 acres, work on this park was restricted to construction of towers, telephone lines, roads, and buildings for fire-protection purposes. Four steel and four wooden lookout towers were erected on strategic points. It was necessary to extend the existing system of telephone lines by six miles of new line to complete the hook-up of these towers. The main activity was road construction; this comprised the building of 36 miles of new road and the improvement of 95 miles of existing road. Two storage dams were constructed. New building construction consisted of three cabins, two storehouses, and one stable. In addition, three cabins were repaired.

FOREST PROTECTION

Research work in forest-fire protection is carried on by the Dominion Forest Service at forest experiment stations and also in co-operation with several of the provinces and with the National Research Council. The system developed by this Service in recent years for the daily measurement and forecasting of forest-fire hazard for the guidance of protective agencies is now widely used in Eastern Canada. Research work is carried on to improve methods, equipment, and technique for detecting and suppressing forest fires, and to increase the efficiency of fire-protective effort. The annual statistics of forest-fire losses in Canada are compiled by the Forest Service from information supplied by the provincial authorities.

Over Canada as a whole, the forest-fire losses for 1938 were considerably above the average of the past ten years. However, an examination of the statistics by regions shows that, though Alberta passed through the worst fire season on record and the losses in British Columbia were much above the average for the past ten years, the losses in the other provinces were considerably below normal. The total number of fires reported in Canada during 1938 was 6,647, compared with an average of 6,249 for the ten years 1929-38. Of these fires 16 per cent were attributed to lightning, and the remaining 84 per cent to human agencies. The total loss and damage, including cost of fire-fighting, was $6,266,572, compared with an average of $5,357,035 for the same ten-year period. The detailed statistics of forest-fire losses and causes for the ten-year period 1929-38 will be found in Tables 1 and 2. A description of the fire season and losses by regions follows.

Forest Fire Statistics

BRITISH COLUMBIA

The fire season of 1938 was the worst experienced in many years in British Columbia. In general, the season was characterized by a 50 per cent decrease in normal rainfall and a 4 per cent increase in normal temperature. This resulted in a general drought condition early in May, which reached a climax at the end of July and culminated in extreme fire-hazard conditions in all parts of the province except the northern interior. Fires caused by the carelessness of the general public show a tendency to increase. This tendency follows increased travel in, and use of, the forest by the public.

	1938	Average 1929-38
Total number of fires	2,412	1,808
Proportion caused by lightning, per cent	30	26
Merchantable-timber area burned, acres	92,385	84,775
Young-growth area burned, acres	113,930	111,288
Cut-over area burned, acres	394,275	278,758
Non-forested area burned, acres	111,228	45,600
Total area burned, acres	711,818	520,422
Damage	$2,230,767	$1,150,205
Cost of fire-fighting	$487,708	$247,238
Total damage and costs	$2,718,475	$1,397,443

ALBERTA

In respect of forest area burned and difficulty of fire suppression, the fire season of 1938 was the worst ever experienced in Alberta. This arose from a succession of dry years, a condition which continued throughout the season in the northern portions of the province. Seasonal vegetation ripened early, and provided additional hazard in the autumn. The ground was extremely dry, and many fires burned deeply, were almost impossible to extinguish, and flared up under strong winds in the autumn, spreading over large areas.

	1938	Average 1929–38
Total number of fires	521	344
Proportion caused by lightning, per cent	2	3
Merchantable-timber area burned, acres	456,233	104,901
Young-growth area burned, acres	415,288	133,538
Cut-over area burned, acres	44,441	13,105
Non-forested area burned, acres	842,384	153,466
Total area burned, acres	1,758,345	405,010
Damage	$2,090,676	$659,534
Cost of fire-fighting	$198,728	$61,349
Total damage and costs	$2,289,404	$720,883

SASKATCHEWAN

The 1938 spring season in Saskatchewan opened with every prospect for a repetition of the severe conditions which prevailed in 1937. However, reasonably frequent rains, together with cool nights and the absence of protracted periods of extreme heat, high winds, and dry lightning storms, tended greatly to curtail the outbreak of fires. After nearly five years of scanty precipitation, the water-levels in lakes and streams were very low, and smaller bodies of water such as swamps and sloughs were completely dry; fire-fighting was thus rendered difficult. This condition will continue until a series of wet years has replenished the natural water supply.

The worst periods of hazard occurred in May and June; good rains in July reduced the hazard for the rest of the summer. A threatening autumn fire situation was ended by rains early in October. Precipitation was generally low in the northern part of the province throughout the season, and fires burning in the ground were difficult to extinguish owing to lack of water.

During the year a reduction was made in the area given organized fire protection. In previous years a measure of organized protection was provided for 30,000,000 acres of forest lands. This year the area was reduced, and effective protection was provided for 11,000,000 acres of selected forest lands.

98150—6½

It was, however, frequently necessary to fight fires outside the protected areas, and these fires accounted for a considerable portion of the total area burned over.

	1938	Average 1929–38
Total number of fires	231	271
Proportion caused by lightning, per cent	4	4
Merchantable-timber area burned, acres	18,578	56,573
Young-growth area burned, acres	86,990	235,914
Cut-over area burned, acres	3,798	12,456
Non-forested area burned, acres	3,029	164,594
Total area burned, acres	179,961	469,537
Damage	$36,404	$297,364
Cost of fire-fighting	$25,141	$70,188
Total damage and costs	$61,545	$367,552

MANITOBA

The fire season of 1938 was an unusual one in Manitoba. The number of fires and the cost of fire-fighting were the highest since 1929, although the amount of damage done was not abnormal. The distribution of fires both as to time and locality were unusual. Fires in September and October made up 52 per cent of the whole, although normally fires at this season are relatively unimportant. There was an unusual concentration of fires in the north of the province at the end of June, and a similar concentration in the southeastern section during September and October.

The ground was very dry along the western border of the province when the freeze-up occurred in the autumn of 1937. This tended to produce an early spring fire-hazard in that region. A short period of extreme hazard which developed in the north during the latter part of June was ended by rains during the first week of July, and little serious hazard occurred anywhere in the province during July and August.

Low precipitation in the southeast led to a serious hazard in September and October that resulted in a large number of fires over a wide area.

	1938	Average 1929–38
Total number of fires	557	395
Proportion caused by lightning, per cent	2	14
Merchantable-timber area burned, acres	46,268	57,566
Young-growth area burned, acres	43,949	62,358
Cut-over area burned, acres	3,153	4,901
Non-forested area burned, acres	79,620	429,396
Total area burned, acres	172,990	554,221
Damage	$115,192	$239,973
Cost of fire-fighting	$50,439	$41,975
Total damage and costs	$165,631	$281,948

ONTARIO

Weather conditions were generally favourable, and particularly in the eastern part of the province an unusually small number of fires occurred. In September and October the weather was fairly dry, especially in the western part of the province. The only serious fires occurred in the Fort Frances district, and these accounted for over 70 per cent of the total area burned over. These fires, for the most part, started in the settled areas outside and spread into the fire district.

	1938	Average 1929–38
Total number of fires	1,292	1,668
Proportion caused by lightning, per cent	19	20
Merchantable-timber area burned, acres	47,355	193,741
Young-growth area burned, acres	49,704	101,370
Cut-over area burned, acres	23,402	34,924
Non-forested area burned, acres	17,784	128,113
Total area burned, acres	138,245	458,149
Damage	$246,127	$1,453,744
Cost of fire-fighting	$90,682	$303,910
Total damage and costs	$336,809	$1,757,655

QUEBEC

The forest-fire season of 1938 was slightly better than average in Quebec. There were a few more fires than in the normal season but the total damage and costs and the total area burned over were well below normal. The spring hazard period was most intense in the northwestern part of the province and in the Lake St. John region. The months of July and August were abnormally wet over most of the province. The autumn hazard period was very severe over the whole province. Settlers clearing land caused 49 per cent of all fires, and only 4 per cent were attributed to lightning.

	1938	Average 1929-38
Total number of fires	1,149	1,017
Proportion caused by lightning, per cent	4	5
Merchantable-timber area burned, acres	33,306	40,726
Young-growth area burned, acres	7,134	34,884
Cut-over area burned, acres	76,587	107,546
Non-forested area burned, acres	8,317	19,999
Total area burned, acres	125,345	202,501
Damage	$402,827	$499,383
Cost of fire-fighting	$154,354	$107,820
Total damage and costs	$557,181	$607,203

NEW BRUNSWICK

The early spring of 1938 was for the most part cold and wet. At the beginning of May the weather became warmer, and the spring fire-hazard developed, reaching a peak during the last week of that month. This period was terminated by rain during the first week in June, except in the northeast portion of the province, which remained extremely dry until June 26. July and succeeding months were wetter than usual, and well distributed rainfall kept the hazard within comparatively safe limits throughout the remainder of the season. Statistics show that settlers' fires during May and June were the most numerous and destructive.

	1938	Average 1929-38
Total number of fires	167	259
Proportion caused by lightning, per cent	6	4
Merchantable-timber area burned, acres	20,211	7,463
Young-growth area burned, acres	291	6,726
Cut-over area burned, acres	325	10,475
Non-forested area burned, acres	1,944	24,261
Total area burned, acres	22,771	48,924
Damage	$67,523	$81,243
Cost of fire-fighting	$24,731	$26,259
Total damage and cost	$92,254	$107,503

NOVA SCOTIA

In Nova Scotia the spring months were fairly dry, and 84 per cent of all fires occurred between March 28 and June 25. The weather during the summer months was generally wet and foggy, and fires were few and small.

	1938	Average 1929-38
Total number of fires	183	377
Proportion caused by lightning, per cent	16	16
Merchantable-timber area, burned, acres	726	1,572
Young-growth area burned, acres	1,317	6,093
Cut-over area burned, acres	327	1,579
Non-forested area burned, acres	2,603	12,557
Total area burned, acres	4,973	21,800
Damage	$2,455	$28,249
Cost of fire-fighting	$5,532	$25,013
Total damage and costs	$7,987	$53,262

NATIONAL PARKS

Forest protection in the National Parks is administered by the Dominion Government, and fires which occur in these areas are not included in the provincial statistics. The statistics for National Parks as a whole follow:

	1938	Average 1930-38
Total number of fires	51	74
Proportion caused by lightning, per cent	4	9
Merchantable-timber area burned, acres	769	2,484
Young-growth area burned, acres	670	5,810
Cut-over area burned, acres	785	663
Non-forested area burned, acres	640	6,450
Total area burned, acres	2,864	15,407
Damage	$4,810	$36,223
Cost of fire-fighting	$4,640	$11.715
Total damage and costs	$9,450	$47,939

INDIAN LANDS

Indian lands are widely scattered throughout Canada. The fire protection on these lands is administered by the Dominion Government. Particulars of fires are as follows:

	1938	Average 1930-38
Total number of fires	81	42
Proportion caused by lightning, per cent	11	12
Merchantable-timber area burned, acres	6,368	2,527
Young-growth area burned, acres	186	1,591
Cut-over area burned, acres	1,381	675
Non-forested area burned, acres	200	1,604
Total area burned, acres	8,135	6,397
Damage	$24,150	$12,007
Cost of fire-fighting	$3,673	$4,058
Total damage and costs	$27,823	$16,065

DOMINION FOREST EXPERIMENT STATIONS

Three fires are shown to have occurred on forest experiment station areas, none of which did any appreciable damage. Actually the only fire which reached any size occurred on cut-over land on the Valcartier Military Camp area adjoining the Forest Experiment Station, and is included in the statistics because it occurred on land administered by the Dominion.

	1938	Average (Excl. of 1933) 1930-38
Total number of fires	3	6
Proportion caused by lightning, per cent	....	17
Merchantable-timber area burned, acres	....	505
Young-growth area burned, acres	2	972
Cut-over area burned, acres	318	40
Non-forested area burned, acres	1	809
Total area burned, acres	321	2,325
Damage	$4	$6,922
Cost of fire-fighting	$9	$645
Total damage and costs	$13	$7,567

FOREST FIRE RESEARCH

The Dominion Forest Service system for measuring and forecasting forest-fire hazard, first developed at the Petawawa Forest Experiment Station, is now in daily use during the fire season throughout the Provinces of Quebec and New Brunswick, for the guidance of forest officers in the administration of fire protection. As a result of studies during the past year the existing fire-hazard tables have been improved and extended to include additional forest types and climatic regions.

At the Petawawa Forest Experiment Station the study of evaporation from the forest floor in relation to that from various types of evaporation-measuring apparatus was advanced to the point where a beginning was made on the preparation of a bulletin on the subject. Studies were continued on seasonal variations in fire-hazard with a view to effecting refinements in existing fire-hazard tables and extending them to include additional forest types.

Performance tests were made on various types of forest-fire pumps and fire-nozzles, and some work was done on the sterilization of fire-guards against plant growth by the use of chemicals.

At the Valcartier Forest Experiment Station a four-year study was completed of fire-hazards in the cut-over pulpwood forests of this region. As in previous years, close co-operation was maintained with the Quebec Forest Protection Service in similar work at their Duchesnay station, and in the study of fire behaviour in relation to weather conditions as reported by their forest-weather stations throughout the province. The research records of some 50 forest-weather stations are checked and compiled at Quebec.

The New Brunswick Forest Service and large forest industries were assisted in the establishment of a network of reporting forest-weather stations throughout the province. The records from these stations, including the computation of the fire-hazard index at each, are checked by the New Brunswick Forest Service at the fire-hazard research station established in 1937 at Fredericton. Work at the latter station was continued and expanded during the past season. A large amount of useful data on fire behaviour was obtained from test fires conducted in co-operation with the forest industries. As a result of a study of all the factors contributing to fire danger on one of the timber limits, it was possible to develop fire-danger tables and a tentative fire-control plan for administration purposes, so as to show the specific action recommended at each degree of fire danger. Similar fire-danger tables of a more general nature have been prepared for the province as a whole.

In co-operation with the National Research Council, performance rating tests were carried out on all Canadian-made forest-fire pumping units. Tests were also carried out to determine the efficiency of various types of fire-nozzles, and to obtain precise figures for the friction losses in linen forestry hose. The data obtained at the Research Council Laboratories and those derived from tests at the Petawawa Forest Experiment Station were made the basis of a joint report issued by the National Research Council.

At the close of the year, and as a result of the year's work, six mimeographed papers were published. These comprise a report on fire-hazard studies in cut-over lands, fire-hazard tables for this type, fire-danger tables and fire-control plans for the New Brunswick limits of the Bathurst Power and Paper Co., a supplement to previous fire-hazard tables for use in New Brunswick, tables for estimating fire-hazard early in the day, and an article on the use of eastern fire-hazard tables in Manitoba and Saskatchewan.

TABLE 1

Statement of Forest Fires in Canada by Years for the 10-year Period 1929-38, with the Average for the Period

—	Year										Totals	Average
	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938		
Fires under 10 acres	.....	.....	.....	.....	.....	.....	.....	4,031	3,886	4,476	.....	.....
Fires over 10 acres	.....	.....	.....	.....	.....	.....	.....	1,915	2,063	2,171	.....	.....
Total number of fires	6,712	6,805	6,965	6,298	6,298	5,911	4,955	5,946	5,949	6,647	62,486	6,249
Total area burned ..... acres	6,028,551	2,670,188	2,093,922	2,463,923	1,008,558	1,475,117	856,183	3,026,646	4,271,431	3,125,768	27,020,287	2,702,029
Merchantable timber— Area burned ..... acres	663,574	746,129	394,824	708,085	204,405	321,414	172,592	919,764	662,792	722,199	5,515,778	551,578
Timber burned .....M ft. b.m.	540,900	779,081	538,551	569,126	255,383	899,545	98,971	2,077,584	408,942	2,160,192	8,328,275	832,827
Timber burned ..... cords	2,178,434	2,043,142	1,241,647	2,705,374	650,318	836,554	785,552	3,524,493	4,354,820	2,557,780	20,878,114	2,087,811
Estimated stumpage value... $	2,803,952	4,452,046	1,715,113	5,063,577	1,199,305	1,754,882	1,254,981	4,646,726	2,082,018	2,777,882	27,750,482	2,775,048
Young growth— Area burned ..... acres	1,092,086	577,980	590,234	586,141	220,620	242,101	191,940	739,701	2,035,830	719,461	6,996,094	699,609
Estimated value..... $	2,004,050	1,456,135	1,215,682	1,209,063	454,648	573,455	326,423	1,284,102	1,161,861	1,286,512	10,971,931	1,097,193
Cut-over land— Area burned ..... acres	720,912	427,285	535,418	772,625	331,614	562,446	258,964	303,348	188,385	548,792	4,649,789	464,979
Estimated value..... $	338,434	275,578	219,776	615,605	187,303	246,031	262,725	66,253	155,276	328,737	2,695,718	269,572
Non-forested area burned.... acres	3,551,979	918,794	573,442	397,069	251,918	349,156	232,687	1,063,833	1,384,424	1,135,316	9,858,618	985,862
Other property burned, value $	301,499	506,779	363,516	264,769	162,075	149,923	355,541	84,560	151,809	827,804	3,168,275	316,827
Total damage..... $	5,447,935	6,690,538	3,514,087	7,153,014	2,003,331	2,724,292	2,199,670	6,081,641	3,550,964	5,220,935	44,586,407	4,458,641
Actual cost of fire-fighting... $	1,237,689	1,135,909	931,504	683,650	509,939	827,451	526,743	1,206,863	878,563	1,045,637	8,983,948	898,395
Total damage and costs. $	6,685,624	7,826,447	4,445,591	7,836,664	2,513,270	3,551,743	2,726,413	7,288,504	4,429,527	6,266,572	53,570,355	5,357,035

TABLE 2

Statement of Forest Fires in Canada by Causes for the 10-year Period 1929-38

Cause	Year																				Total No. Fires	Average	
	1929		1930		1931		1932		1933		1934		1935		1936		1937		1938			No.	%
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Camp-fires	1,347	20	1,265	18	1,481	21	1,329	21	1,202	19	1,111	19	875	18	1,185	20	1,235	22	1,390	21	12,420	1,242	20
Smokers	856	13	790	12	998	14	809	13	893	14	971	17	985	20	947	16	860	14	980	15	9,089	909	15
Settlers	769	11	954	14	1,097	16	1,385	22	1,265	20	946	16	1,143	23	567	9	973	16	1,154	17	10,253	1,025	16
Railways	1,014	15	731	11	625	9	354	6	312	5	255	4	192	4	176	3	232	4	176	3	4,067	407	7
Lightning	1,167	17	1,483	22	880	13	651	10	940	15	957	16	331	7	1,529	26	832	14	1,046	16	9,816	982	16
Industrial operations	222	3	137	2	133	2	91	1	94	1	198	3	123	2	132	2	190	3	176	3	1,496	150	2
Incendiary	387	6	522	8	674	10	746	12	511	8	349	6	400	8	608	10	383	6	558	8	5,138	514	8
Public works	80	1	98	1	97	1	47	1	56	1	104	2	35	1	42	1	88	1	57	1	704	70	1
Miscellaneous known	239	4	266	4	368	5	243	4	300	5	365	6	324	6	288	5	528	9	488	7	3,409	341	5
Unknown	631	10	559	8	612	9	643	10	725	12	655	11	547	11	472	8	628	11	622	9	6,094	609	10
Totals	6,712	100	6,805	100	6,965	100	6,298	100	6,298	100	5,911	100	4,955	100	5,946	100	5,949	100	6,647	100	62,486	6,249	100

White-Pine Blister Rust

In fighting the destructive tree disease known as white-pine blister rust (*Cronartium ribicola* Fischer), it has been found that the only effective treatment lies in uprooting all currant and gooseberry bushes (i.e., the botanical genus Ribes), growing within infection distance of the pines to be protected. No dependence can be placed upon spraying with bluestone or other chemicals, which is the usual method of dealing with plant diseases.

This heterœcious rust has a most peculiar and complex life history. It attacks all five-needle pines, including two important commercial species in Canada—the white pine (*Pinus Strobus*) of Eastern Canada, and the western white pine (*Pinus monticola*) of British Columbia. It spreads each season by three kinds of wind-borne spores. One of these carries the disease only from ribes to ribes, one from pine to ribes, and one from ribes to pine. If the spores come from the leaves of the cultivated black currant (*Ribes nigrum*), these latter can transmit the disease to healthy pines standing fully a mile distant, but if they come from any other currant or gooseberry the infection range is not over 900 feet. Indeed, all things considered, the cultivated black currant is regarded as being ten times as dangerous and effective a rust-spreader as any other species of Ribes. Hence in any rust-control project, the first and most urgent step is to locate and destroy all cultivated black currants growing within infection distance of the pines to be protected.

The remaining stand of our eastern white pine is now largely centred in Ontario and western Quebec. Here the problem of blister-rust control is less difficult than in the pineries of either the Atlantic seaboard or the Pacific slope. The chief reasons for this are the relative dryness of the semi-continental Ontario climate, and the comparative absence of domestic black currant bushes on the largely unsettled Crown lands. Upon the whole, as a result of experimental rust-control field-work already done at the Petawawa Forest Experiment Station, it is known that the carrying on of such work in our eastern white-pine areas is a feasible operation—that is, when the unique value of white pine for purposes of both utility and beauty is duly considered. The estimated stand of eastern white pine in Canada is about 8,000 million board feet of saw material and 10 million cords of pole timber. The existing market value of this stumpage, together with the potential value of oncoming young growth, is such as to render its conservation a matter of concern to both government and industry.

During May, 1938, under co-operative Dominion-Ontario auspices, a survey was made in Algonquin Park and surrounding territory to determine the amount and the rate of spread of the blister-rust disease. This survey showed that on the average, in semi-settled districts, about 10 to 15 per cent of the remaining white pine is visibly infected, whereas in the park itself (devoid, or nearly so, of the cultivated black currant) only one per cent of the pines showed rust infection. The survey, therefore, furnished further evidence of the fact that the Ontario pineries are favourably located for rust-control operations.

In August, 1938, the Dominion Forest Experiment Station area at Valcartier, Quebec, comprising about eight square miles, was accorded initial rust-control treatment. In 1933, 1934, and 1935, 300,000 young white pines were planted here, which now average about three feet in height. In many old or abandoned farm gardens within a mile of these plantations, domestic black currants were growing, and these formed the chief local source of infection. The Forest Service now feels well assured that upon completion of this control project in about three years' time, no further loss from blister rust need be feared at this station.

FOREST PRODUCTS LABORATORIES

The processing of timber into lumber, pulp, paper, rayon, cellophane, wood-distillation products, veneers, plywood, furniture, planing-mill products, and a great assortment of minor products and parts involves many highly complicated mechanical and chemical processes. The Forest Products Laboratories function as a central organization in Canada seeking for new ideas and carrying out investigations to assist industry in improving existing manufacturing practices and in devising new uses for wood. A special feature of their work, on which increasing emphasis is being placed year after year, is the curtailment of waste occurring in the woods and the mills. This is particularly important, since Canada is a very large exporter of wood products and as such must maintain a competitive position in world markets.

The Laboratories carry out their work in close collaboration with industrial associations interested in pulp, lumber, and other wood products, with provincial governments, with other departments of the Dominion Government, and with Canadian Trade Commissioners and timber commissioners in other countries. Most of the problems which engage the attention of the Laboratories arise from the needs of the industry encountered in domestic and export markets.

The main laboratories are located in Ottawa, where all phases of wood utilization are dealt with excepting those relating directly to the manufacture of pulp, paper, and related products. Problems of the latter type are dealt with in the Pulp and Paper Division in Montreal, which works in close co-operation with the Canadian Pulp and Paper Association and McGill University. A branch laboratory is maintained in Vancouver on the university grounds to deal with such problems pertaining to British Columbia timbers as can be dealt with most effectively in a local laboratory.

The following is a brief description of the principal projects which have engaged the attention of the Laboratories during the past year:—

Main Laboratories (Ottawa)

Division of Wood Preservation

Service Tests of Red-stained and Red-rotted Jack Pine Ties Treated and Untreated.—The ties in track were inspected in 1938 after 13 years' service. To date, the renewals of untreated ties through decay amount to 81·9 per cent for the ties infected with small pockets of red rot and 83·8 per cent for the clear ties. For the creosoted ties, the corresponding percentages were 3·0 and nil.

Service Tests of Treated and Untreated Timber.—In continuing the work referred to in previous reports, 94 additional tests were set up. This brings the number of tests now recorded and under observation to 543.

The timbers under observation include railway ties, telephone poles, piling, caps, stringers, and wharf-decking situated at points from Halifax to Vancouver. Completed tests on 7 installations of untreated spruce wharf-decking in Quebec and New Brunswick show an average life of 7½ years with 6 years minimum and 9 years maximum. Definite information on service life is required in order to estimate when and where more expensive treated timber with a longer life can be used to advantage.

Toxicity and Resistance to Leaching of Mixtures of Preservative Salts.—Tests were nearly completed on (1) zinc chloride, (2) a mixture of zinc chloride and sodium dichromate, (3) lead fluosilicate, and (4) zinc fluosilicate. Petri dish tests indicate that the fluosilicates are approximately three times as toxic as the zinc salts, but in wood-block tests there is little, if any, difference in toxicity.

Experimental Treatment of Poles.—There is a demand in Canada for a cheap preservative treatment for the butts of spruce and other species for telephone poles on lines erected in remote districts. Experiments were carried out, and a promising treating process has been developed. Longitudinal holes are bored close together in the butts of the poles near the circumference, and the holes are filled alternately with copper sulphate and sodium arsenite pastes and plugged. The poles are treated and set as soon after cutting as possible, and the bark is left on up to the ground-line. Evaporation of moisture from the tops of the poles draws the preservatives up the sapwood from the holes in the butt. The adjacent copper and arsenic salts are water-soluble; and would soon be exhausted, but, by diffusion, the slightly soluble cupric arsenite salt can be precipitated, and the treatment will provide protection for several years. Test poles in service five years are in good condition, but untreated controls are decayed at the ground-line.

The first commercial application is on 1,600 poles in a power-line to a mining camp in northern Ontario. The preservatives were taken in by aeroplane.

Treatment of Standing Poles.—In co-operation with a subcommittee of the Canadian Electrical Association, tests have been started for the purpose of studying the most effective methods of ground-line treatment of poles. At the present time there are approximately 10,000,000 untreated wooden poles in use in Canada. This has stimulated interest in treatments to arrest the progress of decay at the ground-line. In a pole treated before installation, a treated shell can protect a core of sterile wood, whereas in treatment after decay is established, the preservative must penetrate farther in order to check interior decay, and must be effective for a sufficient number of years to pay for the cost of treatment. The difficulty is that in wet locations creosote will not penetrate and water-soluble salts that can diffuse are not stable. In other locations, the moisture content of the poles is such that neither creosote nor water-soluble salts will penetrate to the depth of established decay.

Distribution of Zinc Chloride in Hemlock Ties after Nine Years' Service.—In ties removed from the main line of the Canadian Pacific Railway after nine years in service, only a small percentage of the zinc chloride remained in ties treated with an average of half a pound of zinc chloride per cubic foot. Decay was progressing under the rail-seat.

Creosote Treatment of Red Pine Poles.—Red pine sapwood is 3 to 4 inches wide, and two essentials in treating it are penetration of creosote and freedom from "bleeding" after treatment. Tests were started on pole sections treated at moisture contents of 30, 20, and 15 per cent in the sapwood with and without steaming. Results to date indicate that sapwood penetration is not complete when the poles are treated at 30 per cent moisture. Treatment at 20 per cent shows complete sapwood penetration and reduces checking in the heartwood when steamed. Information on the effect of steaming on bleeding will be available in 1939. The treatments at moisture contents of 15 per cent are made in order to confirm results obtained by reducing the moisture content from 30 to 20 per cent, the latter being about the lowest moisture content that can be obtained in service.

Co-operative Tests on Methods of Creosote Analysis.—Comparative tests were carried out in the testing laboratory of the Department of Public Works, in commercial laboratories, and at the Forest Products Laboratories of Canada, on the analysis of creosote, according to standard methods, in order to eliminate systematic or accidental errors on the part of the individual operators and obtain a greater measure of agreement.

Examination of Sections of Creosoted Piling from Pier D, Vancouver.—Sections of creosoted piling salvaged from this pier after the fire in 1938 were examined to determine the extent of attack by Teredo after twenty years' service. It was found that structurally sound and well-treated piles, showing a good depth of penetration and absorption of creosote, are resistant to attack, whereas piles having framing cuts, breaks, or checks, and those showing shallow penetration are liable to attack. Samples of creosote were extracted from the sections for examination, and the conclusion was that there had been little change during the period of service, though a sample of the original creosote was not available for direct comparison.

Calcium Borate as Wood-preservative.—Toxicity tests were carried out on wood blocks treated with calcium chloride and sodium borate, and a report prepared incorporating the results of the tests together with such information as could be obtained from the literature. The results indicated that the matter is worth further study.

Treatment of Plot Stakes.—A considerable number of stakes are used by the Forest Service to mark experimental plots in silvicultural studies. Untreated stakes decay in a few years. Since the tops of the stakes are painted, a treatment with zinc chloride, followed by a pressure treatment of the butts with creosote, was developed. Stakes so treated should last 25 years or more.

Treatment of Ties with Medium-temperature Tar.—One hundred ties supplied by the Canadian Pacific Railway Company were treated and installed in the test track at East Templeton, Que., for observation over a period of years.

Developments in tar and coal distillation produce creosotes and tars which differ from those used by the wood-preservation industry in the past, and this has been the case for the last 100 years. The particular type of tar referred to above has a very low viscosity, and penetration in the ties treated was equivalent to that usually obtained with a mixture of 70 per cent creosote and 30 per cent tar.

DIVISION OF TIMBER MECHANICS

Testing of Small Clear Specimens.—On account of suggestions that certain modifications be made in the methods employed by the principal forest products laboratories throughout the world for testing small clear specimens of wood, a series of tests was made upon specimens of varying size, in compression parallel to grain, to determine if change in size of the specimen affected the strength results obtained in tests. Tests were also made to show the effect, upon the recorded hardness of wood subjected to the ball test, of the presence of small quantities of lubricants upon the surface of the test piece. The results obtained disclosed the reducing effect of small quantities of oil, grease, wax, or graphite upon the recorded load.

Logging Sleighs.—The investigation of sleigh-runners of different widths, type of shoeing, and curvature of sweep to determine the effect of variables such as temperature, velocity, and loading was completed. A final report covering the whole of the logging-sleigh investigation was prepared. This report was distributed to the members of the Woodlands Section of the Canadian Pulp and Paper Association. A summary report including proposed standard designs for sleighs for one- and two-horse operation was prepared and submitted to the Committee on Logging Sleighs of the Woodlands Section, which now has under consideration the question of standard designs of logging sleighs.

Glues and Gluing.—The final report on animal glues was completed.

Strength of Dowel-joints.—Continuing the investigation into dowel-joints, butt joints were assembled and tested in tension and in static bending for comparison with dowel-joints. Further tests were made to increase the quantity of data upon which more accurate conclusions might be drawn. These tests included joints made with high-grade and low-grade animal glues and casein glues. From the results of this investigation a bulletin is being prepared for publication.

Plywood and Veneers.—The plywood-press equipment for experimental work on plywoods and veneers was erected, and the heating elements were tested. Temperature control within narrow limits has been satisfactorily maintained, and the apparatus has proved to be satisfactory for preparing hot-plate plywoods suitable for laboratory test purposes.

Holding Power of Nails.—As a result of previous tests it was apparent that impact stresses had a very definite effect upon the holding power of nails. The year's work consisted of the completion of the investigation into the effect of impact stresses. A final report giving an analysis of the work done under this project was prepared. A report was also made of the results of tests upon cement-coated nails used in box manufacture.

Strength of Canadian Cheese-boxes.—As a result of the preliminary testing of cheese-boxes carried out last year, it was believed that by some change in design improvements might be made in the strength of the box. The testing during the current year was directed towards such improvement with considerable success. A cheese-box was eventually developed which withstood three times as much handling as the ordinary type of cheese-box, at a very slight increase in cost. This work was carried out at the request of the Department of Agriculture, with particular reference to export boxes.

The Effect of Different Standards of Conditioning upon the Strength of Corrugated Board and Corrugated Containers.—This work is being carried out as a co-operative project at the request of Subcommittee IV (Shipping Containers) of Committee 6 (Paper and Paper Products) of the American Society for Testing Materials, and in co-operation with laboratories equipped for this purpose in the United States.

The project consists of securing dependable data on the moisture content of container grades of paper boards and of corrugated fibreboard containers, resulting from conditioning these products in accordance with several different procedures in order to determine whether moisture content can be eliminated as a variable by any of the proposed conditioning methods, and whether practical test methods can be evolved which can be duplicated by one or other of the proposed procedures laid down by the Committee. The standards to be used by the committee will be expressed in terms of conditioning at either 40 per cent or 65 per cent relative humidity. The work undertaken by this Division includes only a portion of the total investigation. This was commenced during the year.

Ring-connector Joints.—The introduction of the metal ring-connector in the construction of timber structures has resulted in revolutionary changes in design. One of the difficulties encountered in the use of timber has been to develop the tensile strength of the material at joints. This has in part been satisfactorily developed by means of the ring-connector. For purposes of design it is necessary that the increase in joint strength due to the use of ring-connectors of different types should be determined. The theoretical strength has been computed, and design formulae established. The work so far done by the Division has consisted of testing joints made with seven sizes of ring-connectors in two species of wood—Douglas fir and red pine. Further testing covering slant joints and some larger sizes of ring will be carried out, as well as tests on spruce timber.

Tests were also made upon plain bolted joints to determine the effect upon the strength of the joints of changes in bolt diameter and length. This information is necessary to determine the safe stresses which may be assigned to bolted joints in structures where the length of the bolt becomes an important factor in the strength of the joint.

General.—The following miscellaneous matters also received attention: The effect of blue stain upon the strength of pine lath; the relative merits of beech and white ash for tennis racquets; tests for the Aircraft Inspection Department of the Royal Canadian Air Force of Sitka spruce and other woods for aircraft construction or repair; the strength zones in the wing of an aeroplane involved in a fatal crash for the Civil Aviation Branch of the Department of Transport; the strength of western hemlock ladder stock affected with black streak; control tests for glues used in plywood and furniture manufacture, including casein, animal, and vegetable glues, and water-resistant glues for use in aircraft construction; tests on corrugated, fibreboard and wooden containers for box manufacturers and shippers, including tests and assistance in the design of export packages for electric refrigerators and washing machines.

DIVISION OF LUMBER SEASONING

Kiln-drying.—A study of the kiln-drying of white pine in commercial sizes and grades was begun, and ten charges were completed during the sawing season. These charges comprised No. 1 and 2 Common, No. 3 Common, and No. 1 and 2 Cuts (Shop). The object of the study is to obtain schedules for the different grades and sizes that will permit drying the material with a minimum of degrade in as short a period as is practicable.

The study was initiated at the request of the white pine industry in an effort to determine whether there is any economy in kiln-drying pine straight from the saw over the present air-seasoning practice. There are many obvious advantages to kiln-drying white pine, including the elimination of blue-stain and check, the availability for sale of dry lumber in the same year as it is sawn, a saving in transportation charges, and in yard space. There are, however, certain defects to which this wood is susceptible in ordinary kiln-drying, the most important of which are brown stain or kiln-burn, cupping of the boards, and loosening of black knots in the common grades. Because of the very high cost of the upper grades of white pine and the necessity of keeping down costs to meet competition, this study is being followed closely by the industry.

Drying of 3 inch × 3 inch and 4 inch × 4 inch white oak blanks was continued. These blanks require approximately three months drying and present a difficult drying problem.

Other items included in kiln charges during the year were birch and maple lumber in 1-, 2-, and 3-inch thicknesses, spruce lumber in 2- and 3-inch thicknesses, red pine lumber, and birch maul billets 6½ inches thick. In all, a total of 29 kiln charges were completed.

Shrinkage in Commercial Sizes.—Boards used for moisture control in kiln charges were measured across the tangential and radial surfaces each time they were weighed for the determination of moisture loss, in order to eventually make available shrinkage values of different species of woods for all stages of drying.

Air-Seasoning Studies.—Some work was carried out to determine the effect of the use of grooved crossers in hardwoods piled in seasoning yards, on crosser-stain and crosser-rot, particularly in sap maple and basswood. Crossers narrower than 4 inches are impracticable in Canadian yards, and in order to produce the effect of very narrow crossers the Laboratories recommended that trials be given a crosser with grooves, ¼-inch deep and 1 and 1¼ inches wide, cut down the wide surfaces. Results obtained to date from test piles constructed with these grooved crossers gave promising indications. For certain uses,

notably natural-finish furniture, crosser-stain causes serious loss to lumber producers. The only method adopted previously to prevent crosser-stain was end-piling of the lumber, a method that is costly in labour and yard space.

Brown-stain in Pine.—All available data on chemical brown-stain were reviewed and collated. The stain is serious in the white pine industry, and is particularly likely to occur in lumber which has been in the pile for a long period The stain, so far as is known, does not affect the durability of the wood, but disfigures it so badly that its sale value is substantially reduced.

Chemical Seasoning of Lumber.—Chemical seasoning is the seasoning of lumber, either in kilns or naturally in piles, after it has been treated with common salt, urea, or other chemicals. Lumber may be immersed in salt or other solutions, or dry salt may be spread over the boards, but in either case the moisture in the wood close to the surfaces diffuses the chemical and lowers the vapour pressure at the surface of the board, and the drying of the core or interior section of the lumber is facilitated. It is claimed for the practice that the drying of refractory woods and thick wide stock of all species is accomplished with a minimum of checking.

Considerable work was done on the chemical seasoning of 3-inch and 4-inch maple and 3-inch white pine. Sodium chloride or common salt was used in solution; the maple was kiln-dried, and the white pine was air-seasoned. It was found that treated maple kiln-dried under very severe conditions of temperature and humidity developed very few checks as compared with the untreated material. On the other hand, no discernible difference in drying rate was recorded. This is also true of the white pine being air-seasoned.

Numerous requests were received regarding lumber-drying problems from boat-builders, building contractors, cooperage firms, railways and manufacturers of railway cars, and manufacturers of doors, flooring, organs and pianos, sporting goods, aeroplanes, boxes, and other products.

These requests pertained to such matters as elimination of case-hardening, alterations to kiln structure, suitable drying schedules, piling, and stain prevention. Latterly, too, an increasing number were concerned with the drying of veneers and panel stock.

DIVISION OF WOOD CHEMISTRY

Effect of Immersion in Water on the Resin and Soluble Carbohydrate Content of Pine.—It is claimed by many lumbermen that pine logs which have been in the water for a considerable period yield lumber which holds paint better and is less susceptible to blue-stain and mould than lumber from logs which are sawn without any period of flotation. Work was begun on an analysis of red pine and white pine lumber in order to determine the relative amounts of resin and of carbohydrates in lumber from the two classes of logs.

The Distillation of Wood Tar Obtained from the Manufacture of Producer-gas from Wood and the Use of the Fractions so Obtained as Ore-flotation Agents.—Wood tar from a sawmill obtaining its power from a producer-gas engine operated on Douglas fir wood was submitted for analysis. After removal of the water the dry tar was distilled and the following fractions obtained:

Number of fraction	Boiling-point Range	Percentage of Wet Tar
1	0 to 220° C.	2·70
2	220 to 240° C.	3·03
3	240 to 260° C.	5·06
4	260 to 280° C.	5·86
5	280 to 300° C.	7·13
6	300 to 320° C.	7·31
Total	.....	31·09

These fractions were tested as flotation agents by the Bureau of Mines, and all six were found to have properties which would make them suitable as "promoters," though they were found to be less efficient than the commonly used xanthates. They were found to have little value as "frothers," and could not be substituted for pine oil for this purpose.

Treatment of Cedar Fish-floats.—Cedar fish-floats for gill nets are used in large quantities, some of them in very deep water where the pressure is so high as to cause collapse of the wood structure and penetration of water to such an extent that the floats lose their necessary buoyancy. Experiments were carried out on treated floats of eastern white cedar and western red cedar to determine the effect of water pressure at depths of 50 and 90 fathoms on the absorption of moisture and on collapse. Very satisfactory results were obtained by special treatments with linseed oil of floats of western red cedar.

General.—A study was made of the uses, production, consumption, and cost of active carbon in Canada in connection with a proposal by a European firm to establish a plant in Canada for the manufacture of this product from sawdust.

At the request of the Comité International du Bois, of Brussels, a report was prepared showing the development in the use of producer-gas from wood and charcoal in Canada for power purposes.

Laboratory facilities were provided for a representative of the Dominion Department of Agriculture for a study of starch depletion in wood and its relation to insect attack. A revised report was prepared on cedar leaf oils.

DIVISION OF TIMBER PHYSICS

Reference Collection of Wood Sections.—Sections mounted permanently in balsam were made of glue joints stained suitably for making good photo-micrographic records of cassava glue, animal glues, casein glue, and phenol resin. The woods so prepared exhibited a wide range in hardness from soft pine to yellow birch and hard maple. In addition to sections of glued wood joints, sections of eight timber species were added to the reference collection.

Identification Key for Woods.—The structure of wood as shown under the microscope permits accurate distinction between timber species that is possible by no other means. A method was developed for identifying wood specimens by manipulation of a set of perforated cards, in accordance with the structural characters of the sample of wood to be identified.

Variability of Pulpwood.—The work on this investigation of the spruces and balsam fir in pulpwood stands of Eastern Canada has been summarized for publication as a bulletin. This report indicates the range in density of the wood investigated, and in the relationship between rate of growth and density gives a basis for estimating the pulp-producing quality of wood from measurements of rate of growth. Since density of wood in conjunction with form factor of trees permits computation of the true rate of growth, a better method of evaluating stands for pulpwood production and improved methods for estimating the pulp-producing capacity of wood are provided.

Study of Factors Affecting the Exudation of Fluid Resin in Softwood Lumber.—This investigation was undertaken as a result of numerous instances brought to the attention of the Laboratories in which resin exudation on the surface of finished woodwork such as doors, sashes, and interior trim caused the product to be defective. In some instances the fluid resin exuded through paint surfaces; and sometimes, in painted woodwork, it caused discolouration of light-coloured paint finishes without actual penetration of the paint film.

For investigation of the problems, 50 pine logs were obtained. Most of the logs were stored in water, and some logs were sawed into boards without soaking or previous flotation in order to obtain test material from wood that had not been water-driven. White paint and priming material analysed by the Testing Laboratory of the Department of Public Works and found to be of standard quality in accordance with Canadian Government Purchasing Standards is being used in painting all panels made for this investigation.

General.—Other matters which received attention included the decay of wood in dairy churns; the significance of black streaks in western hemlock ladder stock; variation in the quality and suitability of oak for whisky barrels; the identification of wood and of veneer, plywood, pulpwood, sawdust, wood flour, and other manufactured products; cause of failure in wine casks imported from Portugal; development of internal checks in edge-grain door stock; the reason for the failure of material shipped to the United Kingdom as rock elm; the cause of the occurrence of spots on paper from a certain Canadian mill.

DIVISION OF MARKETS AND ECONOMICS

Sawmill Investigation.—In August and September lumber dealers and representative sawmills manufacturing spruce lumber in eastern Quebec, New Brunswick and Nova Scotia were visited. Particular attention was directed towards the spruce industry because that species, together with balsam fir, constitutes about 70 per cent of the lumber output in Eastern Canada. This trip was undertaken primarily for the purpose of determining the conditions existing in the industry, particularly those affecting the marketing of spruce lumber in the United Kingdom.

Utilization of Sawmill Refuse.—From a study of selected spruce mills it was estimated that the volume of spruce and balsam fir slabs and edgings produced in Eastern Canada in an average year is equivalent to not less than 250,000 cords of pulpwood. Of this quantity, about 175,000 cords is burned at the mills, mainly in refuse burners. The only visible outlet for this huge volume of waste appears to be its use for chemical or other pulps. This form of use is already practised, but only on a very small scale. This situation has been drawn to the attention of the Canadian Lumbermen's Association and the Canadian Pulp and Paper Association, and both bodies have taken steps to co-operate with the Laboratories in finding means of curtailing this waste of raw material. Arrangements were made in co-operation with industry for a field party to study actual production of slabwood in representative mills during the summer of 1939. At the same time, all available information respecting established practice in this kind of waste utilization is to be collected and summarized.

Sawmill Equipment.—Plans and estimates for a portable sawmill to meet certain specified operating conditions were prepared for the information of the Indian Affairs Branch. Suggestions for the organization and operation of the proposed sawmill were also submitted for consideration.

Committees.—The chief of division acted as joint secretary of the Associate Committee on Forestry of the National Research Council, and served on subcommittees of that body.

Trade Inquiries.—A number of inquiries relating to supplies of wood of special quality were received by the Department of Trade and Commerce from Trade Commissioners, and referred to this Laboratory for attention. Miscellaneous inquiries from industry and from individuals, dealt with by this division, were mainly concerned with business opportunities, lumber grading, and profitable means for utilizing waste.

DIVISION OF TIMBER PATHOLOGY

Red Stain in Jack Pine: Its Development in Creosoted and Untreated Railway Ties Under Service Conditions.—Red stain is the early stage of decay caused by the fungus *Fomes pini (Trametes pini)*. This fungus attacks jackpine and other softwood trees; its continued growth reduces the firm red-stained wood to a stage known as red rot, in which condition the strength of the wood has been completely destroyed. The study being conducted is to determine whether *Fomes pini* continues to develop in red-stained wood so as to produce the red-rot stage under conditions obtaining in railway ties in service. During the year examination of cultures made from ties removed from the experimental track in 1937 was completed. It was concluded that during the eight-year service period of this experiment, *Fomes pini* and Fungus No. 2 (a second fungus found associated with reddish discoloration in green jack pine) have been gradually dying out in *untreated* ties. In their place, a large number of moulds and secondary wood-destroying fungi have entered. These ties showed for the most part advanced decay. Of the wood-rotting fungi, *Lenzites saepiaria* was the most frequent and active species.

It was found that creosote introduced by pressure has given excellent protection to the ties. Secondary wood-destroyers were isolated from 6 of the 20 ties analysed, but in every case the extent of the rot which they caused was slight. They entered in every case through checks which developed toward the middle of the upper surface of the tie.

Blue-stain in Softwoods.—A laboratory test was made to determine the efficiency of two new chemicals in controlling mould and stain development in pine. At the end of a four-week test period it was found that one of the chemicals offered no protection against stain, whereas the other gave excellent protection against stain, but was ineffective against mould.

Yard Sanitation: Distribution of Mould and Staining Fungi in the Seasoning Yard.—Arrangements were made for carrying on the work in two seasoning yards in the vicinity of Ottawa. During the summer, agar plates were exposed at bi-weekly intervals at thirteen points in each yard. The plates used were uniform in size, each giving an agar surface of approximately 10 square inches. They were exposed in duplicate. In sheltered places the plates were left uncovered for ten minutes; at more open points the exposure lasted for five minutes only. Exposures were made seven times in each yard from June 30 to September 29. After incubation at room temperature for four to five days a count was made of the circles of growth on each plate. It was found that spores had fallen on every plate exposed, the number per plate ranging from 3 to approximately 500. From the plates, transfers were made from the circles of growth to malt agar slants in culture tubes. An attempt was thus made to isolate as many as possible of the fungi which had established themselves on the plates, and to procure enough cultures to get some idea of the distribution of the different types in the yards. A study of these cultures is being made with a view to determining the prevalence and distribution of fungi injurious to lumber.

Relative Susceptibility to Blue-stain and Mould of Winter-felled, River-driven Pine and Summer-cut Pine Sawn Green from the Stump.—The opinion prevails among pine lumber manufacturers that lumber made from logs which have been river-driven or which have been stored for prolonged periods in water does not stain as readily as that made from logs which have not been subjected to the leaching action of water. To determine whether or not this opinion has a basis in fact, a test was carried out during the summer of 1938. Logs were obtained of red pine and white pine. Of each lot, some were summer-felled and delivered green from the stump; some were of the winter cut of

1936-7, river-driven and water-stored; the remainder, also river-driven and water-stored, were cut in the winter of 1937-8. The logs were converted to boards which were inserted in piles of green, common pine lumber in a seasoning yard in Ottawa. After seasoning for three months, the test boards were removed from the piles and examined for stain and mould. No mould was noted on any board. As regards stain, the results lend support to the prevalent opinion regarding the relative susceptibility to stain of river-driven pine and pine sawn green from the stump, but before final conclusions are drawn it is considered advisable to extend the experiment and carry it out with a larger amount of material.

General.—On request from industry, information was supplied on a variety of problems including sapwood stain and its control; fungal infection in pulp-mills; decay in buildings; the cause and control of brown-stain in pine; decay of logs in storage; the relative durability of composition boards; yellow-stain in fish-boxes; red-stain in jack pine; specific cases of decay in wooden articles in service; and the identification of fungi associated with decay.

DIVISION OF WOOD UTILIZATION

Use of Yellow Birch and Hard Maple for Spokes and Felloes of Artillery Wheels.—Although this project is specifically concerned with artillery wheels of yellow birch and hard maple, the data obtained are applicable to other types of wooden vehicle wheels that are now made chiefly of other woods. After four and a half years of service testing by the Department of National Defence the experimental wheels used in this project show no signs of mechanical failure, and it is, therefore, considered that they have proved their worth in this respect. No decay is yet apparent either in the chemically treated wheels or in those which are untreated. From the standpoint of manufacture, birch has proved somewhat superior to maple.

Wood Taint in Butter-boxes.—The British Columbia lumber industry has an export market for timber for butter-boxes, particularly in Australia. An important requirement for such material is that it does not impart taint to the butter. Western hemlock has given satisfaction in this regard, but it was desired to know whether certain other British Columbia species would prove satisfactory. In co-operation with the British Columbia Lumber and Shingle Manufacturers' Association and the Dominion Department of Agriculture, an experiment was undertaken in this connection.

Over two tons of butter were packed in various ways in boxes of Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), amabilis fir (*Abies amabilis*), and grand fir (*Abies grandis*), and placed in cold storage. Final sampling will be done by expert butter graders of the Department of Agriculture at the end of a suitable period of storage.

Use of Wood for Fuel.—Not only does wood rank as an important fuel, but the 9,287,000 cords of it used each year for this purpose constitute the largest single item drawn from Canadian forests. In view of this fact, the efficiency with which wood can be burned was investigated in a series of tests conducted in co-operation with the Fuel Research Laboratories of the Bureau of Mines. Seven types of stove and three types of furnace, some of foreign and some of domestic origin, were compared. The results of 37 individual trials showed that the new European types of stove are not inherently more efficient than Canadian stoves of the usual patterns, but that the latter are sometimes inefficient, not because of poor design, but because of lack of precision in manufacture. This means that stoves which are badly manufactured may operate at only 20 or 30 per cent thermal efficiency when the design itself may be capable of attaining double this efficiency.

Some European furnaces, on account of the arrangement of a magazine feed, are capable of operating without attention for periods three times as long as is the case with similar Canadian furnaces. This makes for greater convenience in operation.

Use of Sawdust for Fuel in Eastern Canada.—Each year large quantities of sawdust are destroyed at sawmills in Eastern and Central Canada for lack of profitable outlets. With a view to improving this condition experiments are being carried out in co-operation with the Fuel Research Laboratories of the Bureau of Mines to determine whether this sawdust can, without the need of costly processing, be used satisfactorily as a domestic fuel under the severe climatic conditions prevailing in the region. The experiments are not yet completed, but the results so far obtained are encouraging.

Exhibits.—An exhibit emphasizing the many uses of forest products in industrial chemistry was displayed at the joint convention of the Society of Chemical Industries, the Canadian Chemical Association, and the Canadian Institute of Chemistry held at Ottawa in June, 1938. Plans were drawn up for the Canadian exhibit of forest products to be shown at the New York World's Fair.

General.—Miscellaneous problems receiving attention had reference to the manufacture and grading of lumber; the manufacture of, and markets for wood flour and excelsior; methods and materials for house insulation; problems of the furniture industry; methods of coating wooden food containers; methods for rendering wood water-resistant; advice in preparing specifications for lumber and timbers for special purposes; the methods of peeling pulpwood; assistance in selecting the most appropriate woods for unusual purposes as well as in locating sources of the most suitable grades and sizes of material for special needs. Fully half the inquiries, however, concerned the use of wood in various forms for fuel.

COMMITTEES

Members of the staff of the Laboratories served on committees of the following organizations:—

Canadian Engineering Standards Association.—Committees on Wood Piling, Fire Tests, Structural Timbers, Logging Chains, Wood Poles.

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

American Society for Testing Materials.—Shipping Containers, Timber, Paper and Paper Products (Containers).

Canadian Pulp and Paper Association.—Joint Administrative, Woodlands and Technical Sections, Logging Sleighs.

National Research Council.—Associate Committee on Forestry.

Comité International du Bois, Brussels.—Translations.

Canadian Government Purchasing Standards Committee.—Subcommittees on Paper Quality and on Wood Preservation.

Publications and Papers Issued

The following publications were issued by the Ottawa laboratories:

Efficiency of Logging Sleighs for Pulpwood Operations in Different Types of Terrain, (mimeographed), by W. E. Wakefield.

A Grooved Sticker for Lumber, by M. J. Brophy.

Kiln-drying Common Grades of White Pine, by M. J. Brophy.

Prevention of Crosser-stain in Maple and Basswood, by M. J. Brophy.

Storage and Care of Kiln-dried Lumber, by J. R. Coleman (English and French).

Relative Humidity in Kiln-drying, by M. J. Brophy (English and French).
Steaming in Kiln-drying, by M. J. Brophy, (English and French).
Uses of Sawdust, (mimeographed), by J. D. Hale.
Utilization of Sawmill Refuse, by J. D. B. Harrison.
Slime in Pulp and Paper Mills, by Clara W. Fritz.
Twenty-five Years of Forest Products Research, by T. A. McElhanney.
Utilization Problems in the Wood-using Industries of Canada (excluding Pulp and Paper), by T. A. McElhanney.
Forest Products Research in Relation to Canadian Economy, by T. A. McElhanney.
Wood-preservation Research: A Review of the Work in Progress at the Forest Products Laboratories of Canada, by J. F. Harkom.
Treatment of Timber with Preservatives: Fire-retardant Methods, by J. F. Harkom.

The Pulp and Paper Division, Montreal

The chief activities of the Division during the past year were mechanical pulping studies; chemical pulping studies; printing studies; and technical services, including the study and analysis of methods of pulp and paper testing, calibration and inspection of instruments for testing of pulp and paper, routine testing, analysis of wood-pulps and paper submitted by firms and individuals, and the furnishing of information on a variety of problems relating to the manufacture of pulp and paper.

Mechanical Pulping Studies.—The object of these investigations is a better understanding of the manner in which mechanical pulps are produced from wood by grinding and refining, with a view to improving the quality of the product and decreasing the cost of its production.

The effect on grinding behaviour and pulp quality of wood properties such as moisture content, density, and rate of growth was studied in some detail for white spruce.

Tests were made on a new type of pulpstone submitted to the Laboratories for examination. These stones are constructed of domestic garnet sand and high tensile strength cement. The results to date have been quite encouraging, and point to the availability in the near future of cheaper pulpstones manufactured in this country.

An auspicious start has been made on a detailed study of the relationships existing between the main grinding variables—pressure, speed, sharpness of stone, production rate, and power consumption. The purpose of this investigation is to place further research on a sound quantitative basis.

It would appear from preliminary investigations that the temperature of pulpstones in the grinding zone and the extent to which pulp is carried out and re-enters the grinding zone may exert important effects upon rates of production, energy consumption, and pulp properties. In view of the remarkably high rates of production obtained from a miniature laboratory grinder, it would seem important to study these effects with care in order to see whether improvements in present commercial grinding practice may not be capable of realization. Since 85 per cent of newsprint today consists of groundwood, there is a growing demand for such improvements in mechanical pulp as may lead either to a greater elimination of chemical pulp or to improvements in the printing qualities of the sheet, the latter being desirable in order to permit finer illustrations in all sections of newsprint. Refining coarse groundwoods or softened chips offers attractive possibilities both for elimination of sulphite pulp and for improved printing qualities.

Chemical Pulping Studies.—The object of these investigations is to increase present knowledge of chemical pulping processes. Attention is now focused upon obtaining greater yields and lower costs of sulphite pulps suitable for use in newsprint after mechanical processing.

The refining of groundwood tailings which had been softened by slight cooking was studied. This waste material gave refined pulps that would be of little or no value. The probable cause of this disappointing result was found during an examination of specimens of white spruce which gave weak degraded sulphite pulps. On testing specimens from one hundred trees, of white and black spruce, balsam fir, and jack pine, it was discovered that wood degraded by sulphite cooking is of common occurrence in these species. The proportion of it in any one log, however, is not likely to exceed 20 per cent, and that in the wood examined was only about 4 per cent of the total wood volume. A consideration of the mode of occurrence of degradable wood and experimental production of it from normal wood showed that this fault is most probably due to compressive stresses in the tree.

Systematic investigation of a new process of pulping by treatment of wood with a gas, mentioned in the 1937-8 report, was continued, with a view to determining the optimum conditions of operation and estimating some of the economic factors involved. The results obtained have been most encouraging and indicate a number of advantages which might accrue from the commercial application of this process. It is proposed to make a qualitative study in order to determine the range in conditions under which the process can be operated and to evaluate the pulp made under various conditions of treatment, particularly such as will give yields ranging from 75 per cent to 80 per cent. A number of factors must be considered, such as moisture content of wood, size and shape of chips, and the amount of sulphur consumed in pulping. Factors which affect the colour of the finished pulp are also receiving attention, and any results obtained should be of value to industry, which is showing an increased interest in the colours of unbleached sulphite pulp.

Printing Studies.—The object of these investigations is to find out those properties of paper which affect its printing qualities and the effect of variations in furnish, stuff-processing, sizing, fillers, paper-making, and surfacing processes. Such knowledge assists in the selection and preparation of different types of paper for printing operations.

Studies on the oil-wettability of different pulps show that sulphite and kraft pulps, whether bleached or unbleached, and whether beaten or unbeaten, differ only slightly in oil-wettability. The behaviour of high-gloss inks on paper has been shown to be dependent on the oil-resistance of the paper. Papers with high oil-resistance produce the best gloss.

By means of a newly designed miniature press it is possible to print paper under controlled conditions of printing pressure, amount of ink, nature of packing, and other variables. It is hoped that such work will lead to a clearer insight into the ink-paper relationship.

Investigations in progress at the present time include the development of suitable methods of assigning a numerical value to the quality of half-tone printing, and of methods of determining printing pressures during printing on flat-bed and cylinder presses.

Means have been devised for comparing the dimensions of half-tone dots with the corresponding portions of the plates from which the impression was made. By examining half-tone dots or solid blacks with a photoelectric cell, it is hoped to assign a numerical value to uniformity of impression in printing. This method, if successful, would enable comparison to be made between different types of paper and, which is more important, between different grades and specimens of the same kind of paper.

The relative influence of printing processes, elasticity of backing, softness and absorbency of paper, and inequality in paper surfaces should then be capable of correlation, a task which has not hitherto been possible owing to the lack of any method for evaluating quantitatively the quality of the impression.

Post-graduate Student Investigations.—A number of students (10 during the past year), under the direction of Dr. O. Maass, of McGill University, investigated problems closely allied with the interests of the pulp and paper industry. These students were given laboratory facilities, and their work was a part of the laboratory program. The problems assigned to them related to the fundamental science of cellulose and paper technology.

During the past year, six of these worked on problems relating to the manner in which water associates itself with cellulose, and progress was made toward a better understanding of this most important factor in the utilization of cellulose.

Three others worked on problems relating to the sulphite cooking process. The tenth studied the relationship of total surface and void fraction of finely divided solids such as pulp, and the rate of flow of liquids through such a mass.

These studies all produced data of value to the industry; but it is recognized that the primary objective here is the training of the men for the industry.

Work on the relation between wood and cooking liquors was continued. Methods have been devised for measuring the rates at which electrolytes diffused into chips and the effect of previous chemical treatment of the wood upon the rate of diffusion. Previous work on the rate of delignification of wood-meal by calcium-base and magnesium-base sulphite liquors has been extended to high concentrations and temperatures. This work will be further extended to cover sodium-base liquors.

In the cellulose-water system further work has been done on the adsorption of water vapour by paper under varying conditions of relative humidity. Additional measurements have been made of the heat of wetting of dry cellulose and pulp by water and on the specific volume and density of the water so adsorbed.

The density of cellulose in different media has been determined by successive displacements of one medium by another without the pulp being dried at any stage. This work is being continued.

Preliminary experiments have been made on the rate of drainage of water through beds of unconsolidated particles, and this work is now being extended to pulps; it is expected that the investigation will shed light upon the drainage of water from paper during the operation of forming the web on fourdrinier wires and cellulose moulds.

Technical Services.—Demands for improved illustrations on all pages of newspapers, coupled with decreased tonnage requirements, has focused attention on the printing qualities of newsprint, and the effect on them of variations in the ratio of sulphite to groundwood, wood species, the groundwood process, and small additions of dyestuffs and mineral fillers. In co-operation with several large producers, the Division has succeeded in classifying newsprints by means of brightness measurements, as plain, tinted, or dyed. Different mineral fillers when used in permissible amounts produced widely varying effects upon opacity of newsprint.

In co-operation with the Technical Section of the Canadian Pulp and Paper Association, the Division evaluated pulps made by refining rejections from groundwood pulp screens, using various commercial refiners. Pulps so produced are returned to the system and sold as newsprint. The refiners tested fell into two groups. One type of refiner converts rejections into a well-fibred pulp, sometimes superior to the original screened pulp. The other type grinds rejections to a degree where their presence in the finished newsprint is not noticeable. The percentages of acceptable stock before and after treatment were determined, and the refined pulp was examined with respect to its physical properties and the effect of its admixture in various proportions in the finished sheet.

The dimensions of different fractions of pulps classified by the Johnston classifier were found to be in substantial agreement with similar results obtained two years ago. Complete data are available on groundwood, kraft, sulphite, and soda-poplar pulps.

Sheets which were made by using semi-polished plates, in the British Standard Sheet Machine, gave results indistinguishable from sheets made from mirror-polished plates, but are free from sticking or picking. A simpler and more economical form of gridplate has been developed.

It was found that groundwood characteristics are affected by disintegration of laps for testing, thus causing confusion between the seller, who tests before lapping or while the lap is fresh, and the buyer, who tests after disintegrating a lap which has had more or less opportunity to dry out.

Aluminium foil has been tried as a possible material for use in checking the performance of bursting testers. Unlike paper, foil is unaffected by moisture content or relative humidity. Commercial foil is not perfectly uniform, but the ratio of bursting strength to weight per unit area is sufficiently constant for ordinary requirements.

The Hart moisture meter was found to determine the moisture content of paper with sufficient accuracy for purposes of mill control. The temperature of the paper does not affect the accuracy of the reading.

A comparison was made of the properties of typical kraft pulp from mills in Canada and the Southern United States; the Standard Beater test of the Technical Association of the Pulp and Paper Institute was used. The Canadian pulps were stronger in the unbeaten state, but the southern pulps developed good strength on beating.

It was shown that reflecting glossmeters can be used satisfactorily to measure finish of paper boards and that boards graded by skilled graders are arranged similarly by the glossmeter.

Routine Testing of Pulp and Paper.—As in previous years, the Division continued to perform testing services, without charge, for members of the Canadian Pulp and Paper Association. Calibrations of "freeness" testers, pulp-evaluation apparatus, pulp-fibre classifiers, oil-absorption testers, and replacement parts were carried out.

Industrial Investigations.—By special arrangement, a second industrial investigation of the pulping of fruit-tree prunings was carried out by a paper consultant using the semi-commercial equipment of the Division. The pulp was afterwards bleached and converted into cigarette paper.

General.—At the request of the Department of Public Works, an investigation was made of shoals in the harbour system of Port Arthur and Fort William. It was found that in some cases the shoals in question were caused or aggravated by the discharge of solids in the effluents from adjacent pulp and paper mills. Methods for measuring the weight of solids in effluents and factors for their conversion into cubic contents after deposition were outlined. It was suggested that, when the solids in effluents had been reduced to a minimum, metering should be employed to determine the proportion of dredging chargeable to the mill producing the effluents.

At the joint annual meeting of the Canadian Chemical Association and the Society of Chemical Industry of Great Britain, held in Ottawa on June 20, 1938, Dr. H. W. Johnston presented a paper on "Pulp, Paper and Related Industries in Canada".

98150—7

Based on experimental work carried out by the Division during the previous year on the permanence of paper, a draft specification for the purchase of writing and ledger papers for government use was prepared for the Subcommittee on Paper Standards of the Canadian Government Purchasing Standards Committee. It was found that the probable error in the folding-endurance test necessitated the testing of at least 100 samples of paper in each direction in order to determine this property with sufficient accuracy for the purpose of grading; and that surface sizing affected the retention of folding endurance, after accelerated ageing in an oven. It was found that variations in the hydrogen-ion content of papers were not a satisfactory index of the permanence of such papers, as the variations encountered were of the same order of magnitude as the probable error. It was, therefore, recommended that specification be based upon the determination of tearing endurance with the Elmendorf tearing tester, as a measure of the durability of paper, and that the retention of tearing endurance after oven-ageing for 72 hours at 100° C. be used as a measure of permanence of paper. A detailed specification based on these two tests, which are simple and readily performed, was submitted.

Publications and Papers Issued

The following special publications were issued from the Montreal laboratory:

The Control of Printing Quality in the Paper and Board Mill, by Gerard L. Larocque.

The Heats of Adsorption of Alkalis by Standard Cellulose, by J. L. Morrison, W. Boyd Campbell, and O. Maass.

The Effect of Magnesium-base Sulphite-liquor Composition on the Rate of Delignification of Spruce Wood and Yield of Pulp, by J. M. Calhoun, J. J. R. Cannon, and F. H. Yorston.

Measurement of the Dielectric Constant of Cellulose, by H. A. De Luca, W. Boyd Campbell, and O. Maass.

The Heat Content of Water Adsorbed on Cellulose, by J. H. Shipley, W. Boyd Campbell, and O. Maass.

Disintegration of Lapped Groundwood for Test, by W. C. Lodge.

Aluminium Foil for Checking Mullen Testers, by W. C. Lodge.

The Effect of Pressed Plate Surface on the Properties of Test Sheets, by W. C. Lodge.

Requirements of Folding Board, by W. Boyd Campbell.

Studies in Cellulose: Moisture Phenomena, by O. Maass and W. Boyd Campbell.

The Suitability of Wood for Acid Pulping, by H. Green and F. H. Yorston.

Vancouver Laboratory

Problems resulting from efforts to improve utilization of western hemlock and certain of the secondary species continue to influence the work of the Vancouver laboratory. Technical problems connected with the manufacture and use of such species, market extension for the use of the lower grades, closer utilization of all species in order to reduce waste to a minimum, and problems resulting from shipping hazards and from use in export markets have received attention. The successful solution of many of these problems has helped to promote wider use of Western hemlock and Western red cedar in export markets. The following report indicates the progress made during the year on various projects.

DIVISION OF TIMBER MECHANICS

Standard Tests of Mechanical and Physical Properties.—Tests were conducted on yellow cedar. A special shipment of Douglas fir was also tested in

an effort to determine the influence of growth conditions, such as soil, altitude, site, and weather, upon the quality of the timber. Specimens were tested in connection with a study to determine the effect of rate of growth upon the specific gravity and strength of Sitka spruce. A study of the effect of the shape of the test specimen upon its maximum crushing strength was completed for Douglas fir and Sitka spruce, when matched pieces, prepared according to Royal Air Force specifications, were tested at 8 per cent and 4 per cent moisture content.

The Effect of Coloration upon the Strength of Douglas Fir.—Tests were completed on two shipments of stained Douglas fir from different areas. The results so far show no significant difference in strength between stained and unstained clear Douglas fir.

Tests of Glued Joints.—An investigation of the strength in diagonal compression of three-ply flush and of dowelled doors showed much greater strength in the flush doors.

The advantages of synthetic resin as a bonding medium have been definitely established, but the high cost of hot presses necessary for present types has been a deterrent to its use. Recently a cold-press resin glue was brought to this laboratory for test, which when used on hard maple showed strength value equal to that of the wood. When used with Douglas fir three-ply and tested in shear, the results obtained were equal to those for similar sections bonded with casein or soya bean glues.

In an effort to devise means for reducing the waste in the manufacture of hemlock boxes and crates, a study was made of built-up box ends. The tensile strength of the glued-up ends was slightly less than that of the one-piece box ends used as controls, but quite sufficient for any ordinary requirement. Exposure tests are in progress to determine the effect of atmospheric conditions on the holding-power of the glue; some sections are being prepared for exposure in cold-storage rooms at varying temperatures and humidities for different periods.

Miscellaneous Tests.—Investigations were carried out on (*a*) tallow-wood and green ironbark for ship's cradles; (*b*) Sitka spruce aeroplane materials; (*c*) Douglas fir ladder stock, to determine the cause of abnormal splitting; (*d*) creosoted Douglas fir wood-stave pipe to determine crushing strength under external load; (*e*) creosoted Western hemlock ties. Inspections were also made of ash for aeroplane skis.

DIVISION OF TIMBER PRODUCTS

Seasoning.—Studies were continued on the rate of absorption of moisture by British Columbia commercial hardwoods in unheated storage, and of end-coated and uncoated 3- and 4-inch western hemlock.

A series of experimental runs was made in the laboratory humidity chamber in connection with the investigation of the effect of the type of case on the rusting of canned goods during ocean shipment. Fibreboard and wooden cases filled with cans of salmon were first chilled, then subjected to atmospheric conditions corresponding to those encountered during shipment through the tropics. A large shipment of canned goods packed in both wood and fibre cases was examined upon arrival in Vancouver after passage through the Panama canal, and the amount of rust occurring in each type of case noted. The Association of Marine Underwriters co-operated in this study.

Specially prepared piles of lumber were exposed to rain for one, three, and thirty days, respectively, in order to determine the effect of exposure to rain on seasoned lumber awaiting shipment.

Data were obtained on the seasoning of Douglas fir timbers and Western red cedar poles, and arrangements were made to study the rate of air-drying and moisture distribution in Douglas fir piling in large stacks.

Tests were carried out to determine the variation in moisture content of 1-inch black cottonwood lumber air-seasoned during the winter and spring months. A small test pile of untreated and Osmose-treated Western hemlock ties was erected to determine whether the preservative treatment reduced the tendency of ties to check during air-seasoning. After four months the average moisture content of both treated and untreated ties was the same, and surface checking had occurred in all ties to a depth from ½ to 1 inch. The rate of drying of 1-inch and 2-inch hemlock in carrier loads was determined in continuance of a study of the feasibility of partially seasoning Western hemlock lumber in carrier or sling loads while awaiting shipment. A study was completed of factors affecting the air-seasoning of rough and surfaced lumber, the object being to determine the relative rate of air-drying of 1-inch and 2-inch Douglas fir and 1-inch Western hemlock when rough and when surfaced ¼-inch off.

Kiln-drying of Lumber.—A study was made of the kiln-drying of Douglas fir parquet flooring blocks manufactured from lumber and from short-length material. Assistance was given to two mills in working out a satisfactory drying schedule and moisture content for long-length material, and two test runs were made in the experimental kiln to determine a satisfactory method of economically piling and drying timber in block lengths.

Two charges of 1-inch black cottonwood were dried in the large experimental kiln. One charge, previously air-dried to reduce the abnormally high green moisture content of the wood, was kiln-dried to a final moisture content of 3·5 to 4·7 per cent in 6¾ days. The purpose in drying the second charge was to study the conditioning of partially kiln-dried cottonwood under conditions similar to those in a factory operating one shift only. It required 14 days of 9 hours drying per day to reduce the lumber from an average moisture content of 14 per cent to 6 per cent.

A special study of the manufacture of seasoned lumber was made in co-operation with the British Columbia Lumber and Shingle Manufacturers' Association to determine (*a*) the cause of internal checking occurring in edge-grain door stock, and (*b*) the recovery resulting from sending to the dry-kiln low-grade lumber containing clear cuttings for remanufacture after drying.

Small quantities of *Abies amabilis* and of *Abies grandis* were dried separately in a large experimental kiln to a moisture content of 12 to 14 per cent for a series of tests of butter-boxes being carried out by the Ottawa Laboratories and the Department of Agriculture.

Tests were made to determine the accuracy of a recently modified capacity-type electric moisture meter using four quadrant-shaped plates placed on the surface of the lumber for contact.

The seasoning of the common or merchantable grades of Western hemlock for export continued to receive attention and a report embodying suggestions for handling, seasoning, and storage of this material was prepared for the guidance of manufacturers.

An outline of the theory of evaporation was prepared for the Research Committee of the Association of Marine Underwriters.

A special two-day advanced kiln course was held at the laboratory with an attendance of twenty-two.

An important feature of this work was the assistance given sawmills and wood-working factories in connection with their seasoning problems, which included:—

(*a*) Use of high temperatures in drying green alder,
(*b*) Failure of yellow cedar Venetian blind stock,

(*c*) Kiln-drying of 6-inch × 6-inch Douglas fir for zinc chloride treatment,
(*d*) Causes of shrinking in hemlock and fir broom-handles used on the prairies,
(*e*) Means of preventing cupping in hemlock box lumber,
(*f*) Cupping in cedar bevel siding,
(*g*) Seasoning of cedar boat lumber, and
(*h*) Drying ponderosa pine factory lumber.

Kiln-drying Shingles.—Examination of twenty-six panels assembled in 1929 to determine the effect of kiln-drying on the serviceability of Western red cedar shingles showed indications of breaking down of the wood structure in small areas and mechanical wear of the spring-wood on some panels. A study was initiated to determine the cause of crushing (similar to collapse) and of dark colorations on the ends of dried shingles. A small test charge of shingles was dried in the experimental kiln as a guide to the study of the drying of shingles in dry-kilns equipped with large internal fans.

Effect of Seasoning on Insects Injuring Lumber.—To assist in revising grading rules covering export shipments, a memorandum was prepared summarizing the results of studies made at the laboratory in co-operation with the Entomological Branch of the Department of Agriculture. It was pointed out that thorough air-seasoning will eventually eliminate all ambrosia insects and that the drying schedules used in commercial kiln-drying practice in British Columbia are more than adequate to kill all beetles, larvæ, and eggs in the lumber.

Advice and assistance were given in the kiln treatment of 40,000 feet board measure of 1-, 1½-, and 2-inch southern oak for boat-building, which was infested with Lyctus beetle.

Application of Chemical Seasoning to British Columbia Woods.—Special flitches of Douglas fir, Western hemlock, Western red cedar, and Sitka spruce 8 inches thick, up to 48 inches in width, and 16 feet long, were kiln-dried for the Department of Trade and Industry, British Columbia, for their exhibit at the San Francisco Exposition. Preliminary to kiln-drying, half the flitches were placed for six weeks in a solution of common salt (NaCl), the temperature of which was gradually raised to a maximum of 140° F. The remainder were layered for eight weeks with dry salt placed on both surfaces and the ends of each flitch.

Five charges of 4-inch × 7-inch Western hemlock that had been immersed in salt solution for varying periods were dried in the small experimental kiln. The results obtained indicate the need for careful consideration of various factors in future studies.

Studies of the effect of chemical treatment on the air-seasoning of 3- and 4-inch Western hemlock were continued.

Sawmill Waste and Its Utilization.—Information regarding the utilization work of the laboratories was compiled for the British Columbia Department of Trade and Industry, the University of British Columbia, lumber and logging associations, and others. The use of a serrated-tooth chipper, specially designed for converting low-grade mill-waste into fuel for domestic sawdust burners, was investigated. Information was compiled regarding the effect of bark and moisture content on calorific values of sawdust as a domestic fuel, and also on the suitability of green hemlock sawdust.

A calorific and moisture-content study was made on selected samples of sawdust manufactured from mill-waste containing a high proportion of bark-covered sapwood. Results indicated that, though the moisture content is higher than normal, the calorific value of the sawdust is slightly greater. The sawdust was found to feed and burn well and to be a satisfactory fuel.

Use of Wood and Charcoal as Motor Fuel.—The laboratory charcoal gas-producer unit was fitted up for demonstration purposes in order to meet demands for information regarding the use of charcoal as a motor fuel.

Tests were made in a co-operative study with the head of the motor mechanics department, Vancouver Technical School, to determine the relative efficiency of a gasoline stationary engine operating on gasoline and on producer-gas. The gas-producers developed only 52 to 70 per cent of the power developed by using gasoline. The tests indicate that, for satisfactory performance under heavy load, an over-powered engine should be installed when charcoal producer-gas is to be used.

Utilization of British Columbia Hardwoods.—The collection of information on the manufacture of red alder and on possible sources of supply of Western birch was continued. This information is of vital importance to the furniture industry in British Columbia. A co-operative study was made to determine the possibility of manufacturing dimension stock from small alder not suitable for sawing into lumber. An investigation was made of the cause of damage to kiln-dried Douglas fir flooring that was covered with a dark stain. An examination was also made of rot that had occurred in 3-inch Western hemlock shipped to Australia; the causal organism was found to be *Fomes pinicola.* An investigation made to determine the cause of rot in a large shipment of clear-grade Douglas fir to South Africa indicated that the trouble was due to improper storage conditions at port of destination.

Relative Durability of British Columbia Woods.—Cross-sections of Western red cedar logs exhibiting zones of straw-coloured wood were sent, on request, to the Government of New Zealand to show that straw-coloured sections in this wood are not necessarily sapwood. As a result, it is reported that Western red cedar will now be accepted for general construction purposes in New Zealand on the same basis as totara and California redwood. Assistance was given the Canadian Pacific Railway in an examination of some 4,600 pieces of piling removed from Pier D, Vancouver, which was destroyed by fire during the year. The study is being carried out in order to determine in what ways the piling had deteriorated during service. The annual inspection was made of wood structures included in the durability tests being carried out in co-operation with the Ottawa laboratory. Selected samples of clear Douglas fir lumber were examined for possible presence of wood-inhabiting fungi, kiln-dried, and delivered to the British Columbia Lumber and Shingle Manufacturers' Association for shipment to the Forest Products Research Laboratory, Princes Risborough, England. This material is to be used for durability tests in comparison with Baltic redwood. Minor projects dealt with under this project included (*a*) the effect of bark on durability; (*b*) effect of water saturation on durability; (*c*) use of Western hemlock for sub-flooring; (*d*) durability of spruce in house construction; (*e*) cause of decay in the penstock and bulk-head of a wooden dam; (*f*) examination of rot found in foundations, roofs, and flooring of various buildings.

Reference Collection of Pathological Material.—One hundred and thirty-one wood specimens were examined to determine the causes of stain, decay, and other defects.

Incidence of Decay in Lumber Cut from Logs Containing Rot.—A study was begun to determine the extent to which fungi responsible for heart-rot in a log may be present in other portions of the log, and the extent to which kiln-drying may facilitate the detection of incipient decay in lumber.

Sap-stain and Mould Prevention: A Study of the Relative Efficacy of Certain Chemicals on Western White Pine, Western Hemlock, and Douglas Fir.—This study was undertaken at the request of the industry in order to provide definite information on the merits of various sap-stain and mould preventives when applied to certain British Columbia species. The woods tested were Western white pine, Western hemlock, and Douglas fir.

General.—In addition to the regular project work, many important problems of a general nature were given special attention, a few of which are noted herewith. At the request of the British Columbia Lumber and Shingle Manufacturers' Association, a brief study was undertaken to determine the effect of various factors on the application of a proprietary preservative to Western hemlock. Recommendations were made regarding the treatment of a special plaster and cork wallboard, intended for use in tropical regions, in order to reduce danger of termite damage. As a result of the reported failure of Douglas fir railway ties to qualify under a special spike-pulling test used in Egypt, information was assembled on the testing equipment, called the "Extrahometer," and made available to the interested firms and to the Forest Products Laboratories at Ottawa and at Madison, Wisconsin, U.S.A.

Publications and Papers Issued

The following special publications were issued from the Vancouver laboratories:—

An Investigation of the Effect of Type of Case (Wood or Fibreboard) on the Rusting of Canned Goods during Ocean Shipments, by J. H. Jenkins.

The Use of Chemicals in the Seasoning of Wide Flitches of British Columbia Timbers, by J. H. Jenkins.

Glues and Gluing, by J. B. Alexander.

Publications of the Dominion Forest Service

The following publications were issued during the year:—

Bulletin, 91, *The Forests of New Brunswick.*

Bulletin 93, *The Physical Qualities of Sulphite Liquors.*

Circular 53, *Brown-stain in Sugar Maple.*

Circular 54, *Strength of Eastern Canadian Spruce Timbers.*

Circular 56, *The Treatment of Fence-posts with Preservatives.*

A revised (fourth) edition of *Forestry Lessons* was also published, and a new edition of the *List of Publications* was brought out.