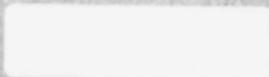


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DEPARTMENT OF THE INTERIOR, CANADA

HON. ARTHUR MEIGHEN, Minister; W. W. CORY, Deputy Minister

FORESTRY BRANCH—BULLETIN No. 64

R. H. CAMPBELL, Director of Forestry

FOREST FIRES IN CANADA

1914-15-16

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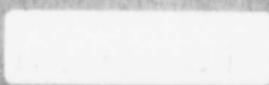


OTTAWA

J. DE LABROQUERIE TACHÉ

PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

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FOREST FIRES IN CANADA, 1914-15-16

INTRODUCTION

There are two principal benefits of gathering and of giving careful consideration to forest fire statistics. First, the spreading of knowledge in regard to the woeful waste caused should awaken the public conscience to the need for greater care with fire in the woods and for better protection. Second, statistics will show in what places, at what times, and on account of what causes the danger of fire is greatest, indicating where greater efforts in the line of fire prevention are needed and pointing out to the organizations that have the work of fire prevention in hand how best to lay out their forces. In this bulletin statistics for the various parts of the country have been assembled separately, and for this purpose the main regions given below have been recognized. Each embraces territory in which conditions are more or less uniform, both in the matter of climate, type of forest, and other natural conditions, and in the matter of distribution of population.

DESCRIPTION OF MAIN FOREST REGIONS

MARITIME PROVINCES

Precipitation.—Heavy, 35 to 55 inches.

Settlement.—Distributed throughout the forested area but comparatively large blocks of unbroken forest, especially in New Brunswick and northern Cape Breton.

Facilities of travel for patrolmen.—Fair.

Methods of travel.—In buggies or canoes, and on foot.

Railways.—Mostly belonging to Dominion Government and not under the regulations of the Board of Railway Commissioners.

Forests.—Mainly coniferous (spruce and balsam), but many hardwood stands of beech, birch, and maple type.

Fire Patrol.—Under Provincial Governments, but no organized staffs employed continuously. No administration in Prince Edward Island, where the forest area is negligible.

QUEBEC

Precipitation.—Comparatively heavy, 20 to 35 inches.

Settlement.—Mainly in the St. Lawrence valley and the Eastern Townships, but penetrating the southern fringe of the northern forest area; the greater part of the province included in the enormous forest region stretching northwards to Labrador and Hudson bay.

Facilities of travel for patrolmen.—Poor. Fair roads through the scattered settlement along the southern fringe of forested area; canoes used exclusively farther north.

Railways.—About half the mileage under the regulations of the Board of Railway Commissioners, remainder owned by the Dominion Government.

Forests.—Mainly coniferous (spruce, balsam, and jack pine), some hardwood stands of beech, birch, and maple type, especially towards the south. Country mainly rocky with numerous lakes.

Fire Patrol.—Under supervision of the Provincial Government mainly carried out by the holders of timber limits, the province paying part of the expense.

ONTARIO

Precipitation.—Comparatively heavy as in Quebec, 20 to 35 inches.

Settlement.—Mainly in southern extension of the province which in the main is completely cleared of forest; scattered settlement throughout northern region in vicinity of railways. The greater part of the province is included in the enormous forest region extending from a line between the southern end of Georgian bay and the Thousand Islands to Hudson bay, resembling similar region in northern Quebec.

Facilities of travel for patrolmen.—Poor.

Methods of travel.—On foot in scattered settlements, and in canoes exclusively in the extensive forest region.

Railways.—Mainly under regulations of the Board of Railway Commissioners, except Provincial and Dominion Government railways.

Forests.—Mainly coniferous; white, red, and jack pine, mixed with hardwood stands of beech, birch, and maple type as far north as the height of land; spruce, balsam, and jack pine type further north and west; country rocky with numerous lakes as in Quebec.

Fire Patrol.—Under the Provincial Government, which requires limit holders to appoint and pay rangers on each berth; an area of 14,468,000 acres in forest reserves and parks under a special staff of rangers.

PRAIRIE PROVINCES.

Precipitation.—Light, 15 to 20 inches. High winds.

General Characteristics.—Treeless prairie, with scattered small poplar stands throughout the southern, densely settled region; settlement penetrating northward from many points on the northern border of the prairie into a forested region comprising the northern two-thirds of the provinces; unbroken timbered area in northern half of the provinces (except Peace River district in Alberta) and along the eastern slope of Rocky mountains.

Facilities of travel for patrolmen.—Fair through the northern fringe of settlement, but poor farther north and in the Rocky mountains.

Methods of travel.—On horseback in the mountains and through the fringe of settlement, and in canoes farther north.

Railways.—Mainly under the regulations of the Board of Railway Commissioners, except the Hudson Bay railway, a short section of the National Transcontinental railway, and a small mileage of provincially chartered lines.

Forests.—Originally spruce, but 80 per cent burned over in past extensive fires and replaced mostly by young stands of poplar or jack pine; extensive muskges and considerable grass land scattered among timber areas; very large lakes in the extreme north but few in the region adjoining settled area, few topographic or other features to obstruct progress of fires, which in past years have swept over enormous tracts.

Fire Patrol.—Under the Dominion Government; regulations in regard to fires under provincial statute, except on 17,000,000 acres of forest reserves established by the Dominion Government; year-long staff of rangers on forest reserves, augmented in the fire season, and rangers employed outside reserves in summer only.

BRITISH COLUMBIA

Precipitation.—Variable; 5 to 30 inches in the interior of the province and 30 to 100 inches on the Pacific coast.

General Characteristics.—A region of high mountains divided by valleys the larger of which in the southern half of the province are well settled. The total forest area of the province is very large and contains nearly one-half the present quantity of merchantable timber in Canada.

Facilities of travel for patrolmen.—Fair in settled regions, but poor within timbered areas where difficulty of travel is increased by mountainous topography.

Methods of travel.—Mainly on horseback; foot patrol on the coast; power launches used considerably along coast and on large interior lakes.

Railways.—Mainly under the Board of Railway Commissioners except a few provincially chartered roads.

Forests.—Almost exclusively coniferous but variable in composition and character with very large timber in the southern coast and interior regions and in the Columbia valley, and smaller timber in the central interior and northern regions. The mountainous character of the country to some extent controls the spread of fires but increases the difficulty of extinguishing them.

Fire Patrol.—In the Railway Belt* and in the Peace River Block, which latter comprises 1,500,000 acres, patrol is under the Dominion Government. Patrol in the rest of the province is under the Provincial Government, which has a well-organized staff. Forest reserves containing 2,500,000 acres have been established by the Dominion Government in the Railway Belt. The year-long staff of rangers on the reserves is augmented in summer, and rangers are employed during the summer only outside of reserves. All forested provincial lands are administered by the Provincial Forest Branch which employs a year-long staff augmented by additional rangers in summer.

NORTHWEST AND YUKON TERRITORIES.

General Characteristics.—An extensive wooded region without railways or means of communication, except along navigable rivers; settlement restricted to scattered fur-trading and mining posts and Indians engaged in trapping.

Methods of travel for patrolmen.—Canoes and steam tugs.

Forests.—Mainly coniferous of stunted character, except along rivers where there is considerable good spruce timber; northeastern portion of territory treeless tundra.

Fire Patrol.—Under Dominion Government; restricted to patrol along rivers and adjacent territory, by rangers employed in summer only; efficient protection of whole area impracticable at present, due to enormous extent of territory, sparseness of population, and poor facilities for travel.

* The Railway Belt of British Columbia, frequently referred to in these pages, is a strip of land forty miles wide and about five hundred miles long extending across the province from east to west. This strip was granted by the province of British Columbia to the Dominion Government as part of the terms of the agreement under which British Columbia entered Confederation. The Railway Belt follows the main line of the Canadian Pacific Railway and extends twenty miles on each side of the same.

INFLUENCE OF WEATHER CONDITIONS

Before taking up the consideration of the actual results of forest fires during the past three years, the causes of fires and of bad fire seasons as illustrated by the experiences of these years will be discussed.

The one uncontrollable factor in the forest fire situation is the weather. No development of efficient organization, no education of the public toward carefulness with fire in the woods, will make it possible to leave this factor out of consideration. Extremely dry periods when the dropping of a match may start a conflagration will always be recurring. A careful study of this question in the present and in the past is very important for every organization engaged in fire protection. Past records will show the danger likely to result under given weather conditions. Other factors may influence the situation but a study of the diagrams hereinafter shows with indisputable clearness the close relation between the weather and the fire danger. Similar diagrams prepared for a given region for a period of years illustrate what danger of fires must be guarded against when certain weather conditions occur in the future, and under what conditions the situation may be considered as reasonably safe.

The careful study of current records is being given an increasingly important place in fire prevention especially as the protective organizations are being developed more efficiently. The following paragraph from the 1915 report of the British Columbia Forest Branch may be quoted:—

"By arrangement with F. Napier Denison, Superintendent of the Meteorological Station on Gonzales Height, Victoria, weather reports for all weather-recording stations in British Columbia were obtained daily. Special forecasts were furnished during the worst periods, and these proved of great assistance. A chart was kept up to date by plotting temperatures and precipitation data from the daily weather reports received. There is opportunity to make a great deal of use of weather-recording stations in forecasting unusual danger periods, and next year it is planned to utilize such information to the fullest extent.

"More weather-recording stations, enabling better weather forecasts to be made, will in time effect a considerable saving in fire-protection cost. Benefit in this direction has already been obtained through systematic study in the manner described."

The comparison of current weather data with past records enables warning to be given of approaching danger. The practical importance of this arises from the fact that fire prevention staffs are organized in a special manner. Usually there is a permanent staff employed throughout the year, where there is administrative work to engage the men in the winter, or at least throughout the whole summer. This staff is augmented first by men employed during the periods when the greatest fire danger *usually* occurs, and further by men employed for short periods when definite danger periods *actually* arrive. Knowledge of the *usual* danger periods secured from the study of past records, and warning of the *actual* approach of special danger obtained from the study of current records is thus evidently of practical value in deciding upon the increases of staff necessary from time to time.

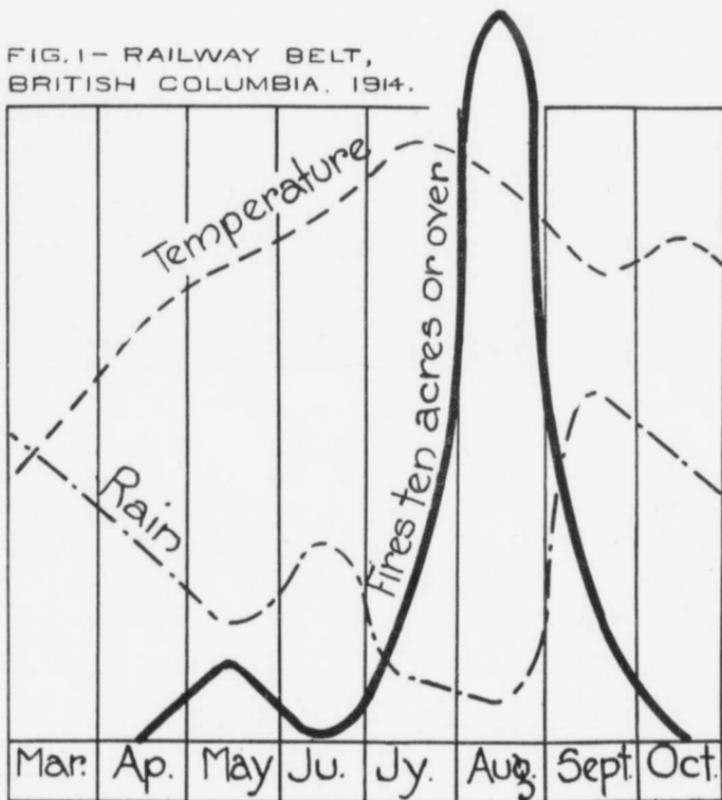
The diagrams on following pages have been prepared by plotting the mean monthly temperatures during the fire season and the number of fires that burned over ten acres in area during each month. The total number of fires was not used as a basis for the diagrams although that is found to give corresponding results. However, it is often the case that in certain seasons there are factors wholly independent of the weather that may cause an increase in the total number of fires. Examples of these factors are the setting of fallow fires by the settlers in the spring, increase in the number of campers, tourists, and fishermen in certain districts in the summer, and of hunters in the fall. Weather conditions may be such that a large proportion of these fires are extinguished before they burn over an area of more than ten acres. The number of fires that do spread beyond ten acres gives a more accurate indication of the real danger of the particular period under consideration from the standpoint of weather alone.

Also the number of fires burning over more than ten acres gives a better indication of the damage done. Statistics of the number of fires occurring each month in Ontario and Quebec were not available.

COMPARISON OF WEATHER AND NUMBER OF FIRES BURNING OVER MORE THAN TEN ACRES
BRITISH COLUMBIA RAILWAY BELT

The first three diagrams show a comparison between the monthly mean temperature and rainfall, and the number of fires occurring each month in the Railway Belt alone. Statistics of the monthly distribution of fires in the remainder of the province are not published by the Provincial Forest Branch. A description of the weather in the rest of the province, as given in the provincial report, is added to the comment following each diagram.

FIG. 1- RAILWAY BELT,
BRITISH COLUMBIA, 1914.

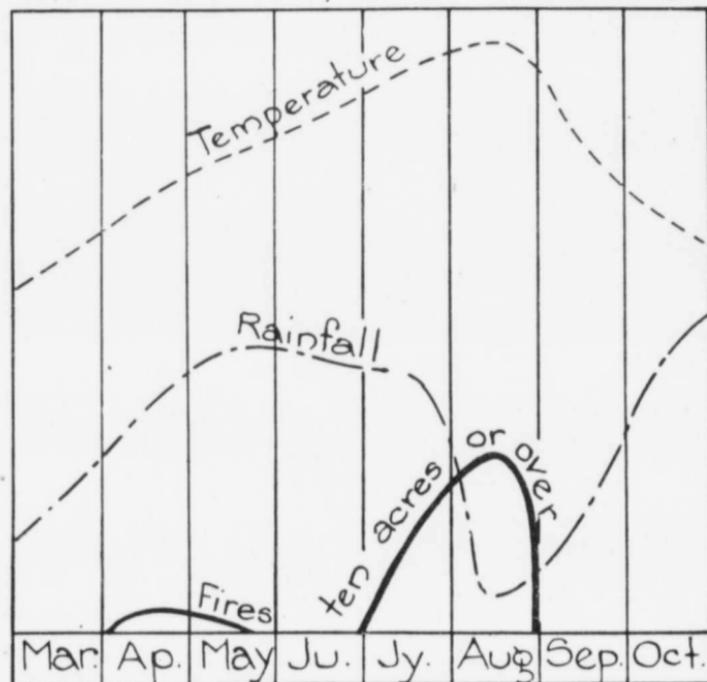


In 1914 low rainfall in May with rising temperatures caused a considerable number of fires, but an increase in rainfall in June reduced the danger. Very low rainfall

throughout July and August precipitated the worst fire season in this region in the three years covered by this report. This was brought to an abrupt close early in September by a rapid increase in rainfall to a point well above normal. Total number of fires burning more than ten acres: 160.

The Provincial Forest Branch report describes the weather in the remainder of the province as much the same as shown in the diagram for the Railway Belt. The early dry period did not occur until June in the southern interior region. During the period of seven weeks from July 25 to September 7, the force in the Nelson, Cranbrook, Vernon, and Kamloops districts (southern interior), and to a less extent in the Vancouver mainland and Vancouver Island district, was engaged almost night and day in fire fighting.

FIG 2 - RAILWAY BELT, BRITISH COLUMBIA 1915.

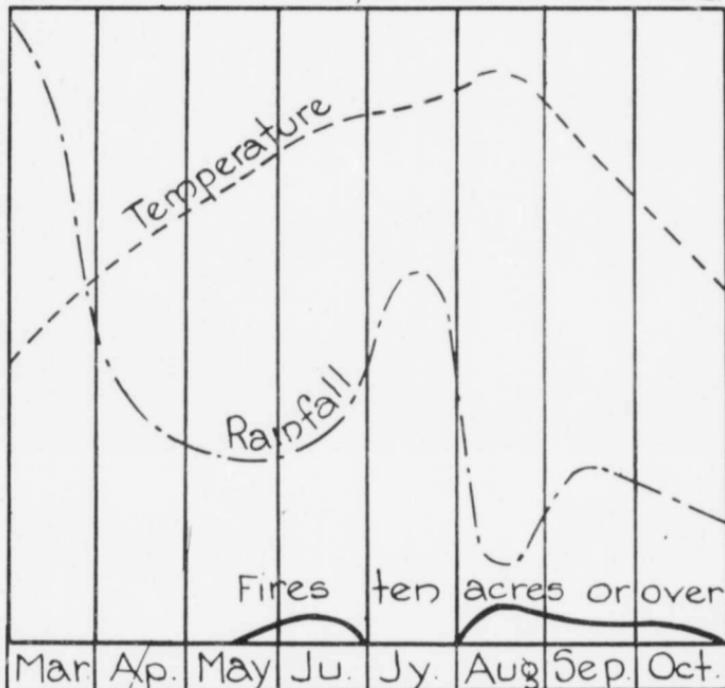


Plentiful rainfall in all months except August made the season of 1915 comparatively safe except in that month. The rainfall in the lower Fraser valley was in July only 1.3 inches and in August 0.2 inches. This reduced the average of the rainfall in the whole Railway Belt although conditions were not specially dangerous in the interior portion. Most of the large fires occurred in the lower Fraser valley where

the situation was for a time serious. Total number of fires burning more than ten acres: 42.

The Provincial Forest Branch report states that the dry period mentioned as having occurred in the lower Fraser valley was confined to the lower coast region and Vancouver island. Conditions were very extreme and only the absence of high winds prevented a disastrous situation from developing.

FIG. 3 - RAILWAY BELT, BRITISH COLUMBIA 1916.



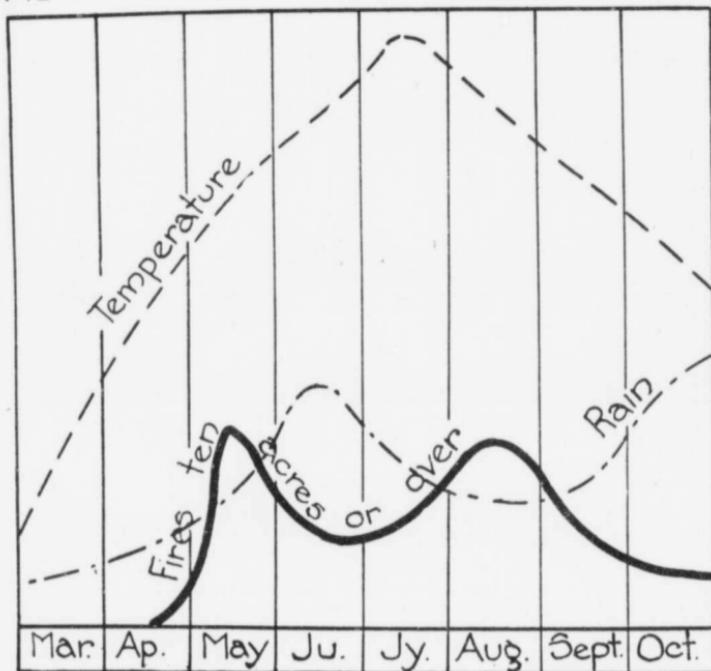
The rainfall was comparatively heavy throughout the season of 1916. The driest period, which occurred in August, was of short duration, and having been preceded by extremely heavy rains in July did not result in a large number of fires. Total number of fires burning more than ten acres: 18.

The Provincial Forest Branch report describes the spring as normal and with very few fires, except in the northern interior. The dry weather in August, shown in the above diagram for the Railway Belt, extended into September and October in the Coast district where many fires started. In the interior there were frequent rains in most districts, although it was dry for a time in some. There was a marked absence of high winds throughout the province during the whole season, making the fires easy to control. On the whole, the season was the least dangerous since 1913.

PRAIRIE PROVINCES

Light rainfall through March, April, and May, 1914, with rising temperatures, caused a comparatively large number of fires in May. Heavier rainfall in June combined with the growth of green vegetation reduced the number. This is a typical phenomenon in this region where there are many areas of grassland and many poplar forests with deciduous undergrowth. The dry grass in the spring combined with rising temperatures and usually light rainfall before the deciduous trees and shrubs

FIG 4 PRAIRIE PROVINCES. 1914



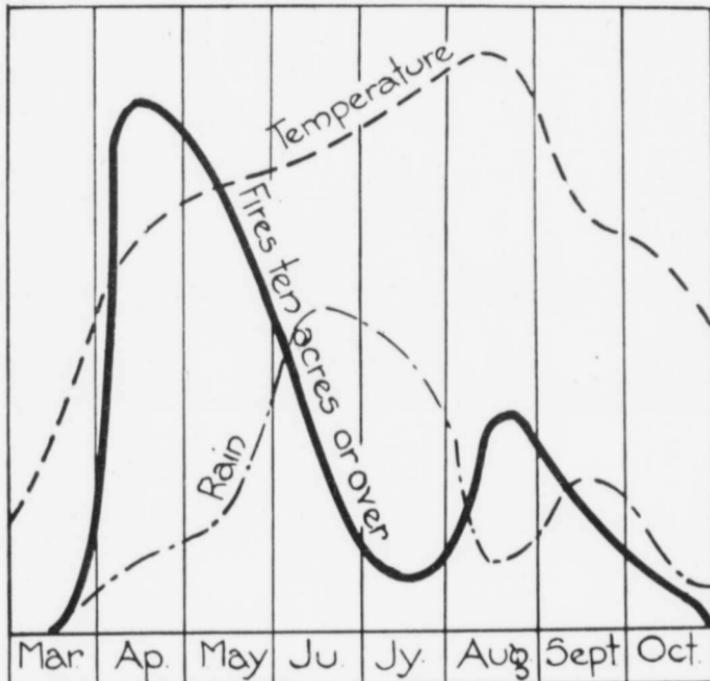
have leaved out makes a dangerous period until the end of May. Then there is comparative safety until the new growth of grass becomes dry in August. The comparatively light rainfall in August, as shown in this diagram, brought up the number of fires in that month. Total number of fires burning more than ten acres: 210.

The spring of 1915 was the most dangerous fire period in the Prairie Provinces in the last three years. The season of 1914 was comparatively dry. During the winter the snowfall was exceptionally light. Spring found swamps and sloughs drained of their water. Added to these conditions was the exceptionally light rainfall of March, April, and May, resulting in a very large number of fires. Plentiful

rain early in June brought the danger period to an abrupt close. Later on in August conditions became dry in northern Manitoba and northern Saskatchewan, resulting in an increase in the number of fires then.

The valleys of the lower Athabaska and Peace rivers and the Mackenzie river in northern Alberta and the Northwest Territories as well as the Yukon did not experience the rainfall in the middle of the summer which is shown in the diagram as having occurred in the main portions of the Prairie Provinces. Widespread fires are reported as having occurred in these regions all through the summer. On account of the lack of development there and the sparse population, full records of these fires

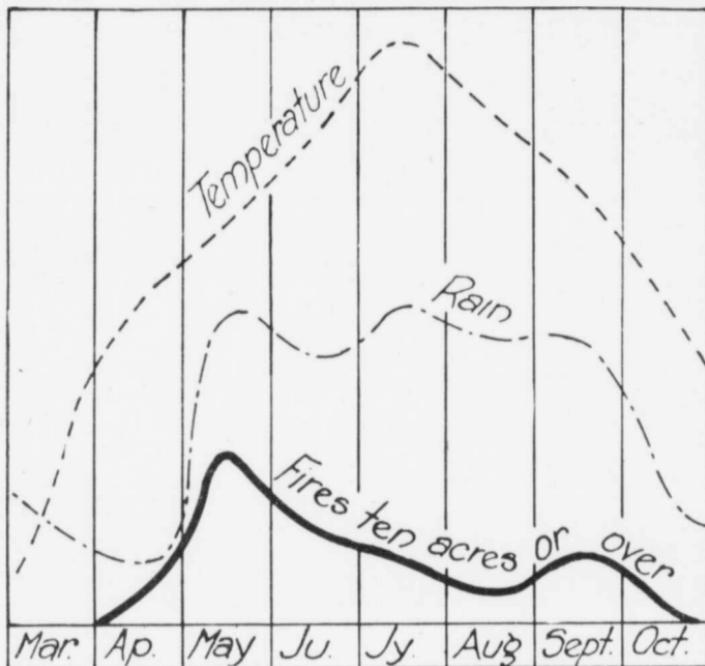
FIG 5 - PRAIRIE PROVINCES, 1915.



could not be secured. The southern part of Alberta received almost normal rainfall, on the other hand, so that there were fewer fires there than in any other part of the Prairie Provinces. The total number of fires burning more than ten acres recorded in the three provinces in 1915 was 442.

High temperature in March and April, 1916, resulted in 45 fires spreading beyond ten acres in area early in May. Comparatively heavy rains in the latter part of the month reduced the danger. Heavy rainfall continued throughout the remainder of the season, so that altogether there were many fewer fires than in any of the last three years. The total number of fires burning more than ten acres in 1916 was 128, a small number for this region. [For diagram for 1916 see next page.]

FIG 6. - PRAIRIE PROVINCES, 1916.

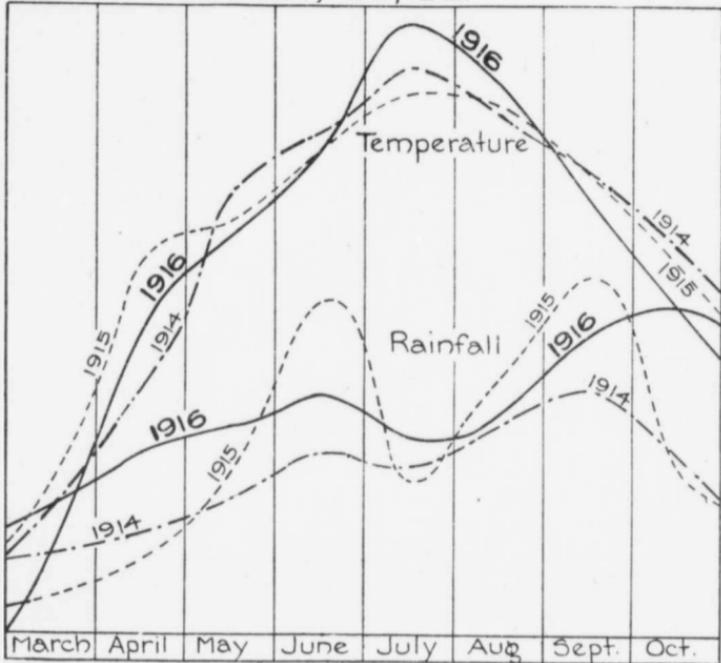


GENERAL OBSERVATIONS.

Some general observations may be made in regard to the above diagrams. They show very clearly that in British Columbia the main danger season is August. In the spring the rainfall is usually heavy enough to make conditions safe until May, at least. In August it is necessary to make provision for an increase in the staff to meet the special danger in that month. In 1914, however, this danger started in July. Therefore, careful study of current weather records is necessary.

In the Prairie Provinces, however, there is a spring as well as a late summer danger period. The former may start at the beginning of April. There is usually a comparatively safe season through June and July. This is also true, though less markedly so, in the Maritime Provinces, as will be seen in the diagrams given in later pages. If the staff is augmented in the spring to cope with the situation then, and if it is desired to keep on the extra men in case of another dangerous period later in the summer, it is necessary in the interest of economy to provide other work for them. On account of the early opening of the fire season, the period during which the extra guards must be engaged is a long one and expensive for the administration. The period of comparative safety in the middle of the season complicates the problem of the administrator who must make provision for the economical utilization of the services of the extra guards when they are not required for continuous fire patrol.

FIG 7 - ONTARIO. 1914, 1915, 1916.



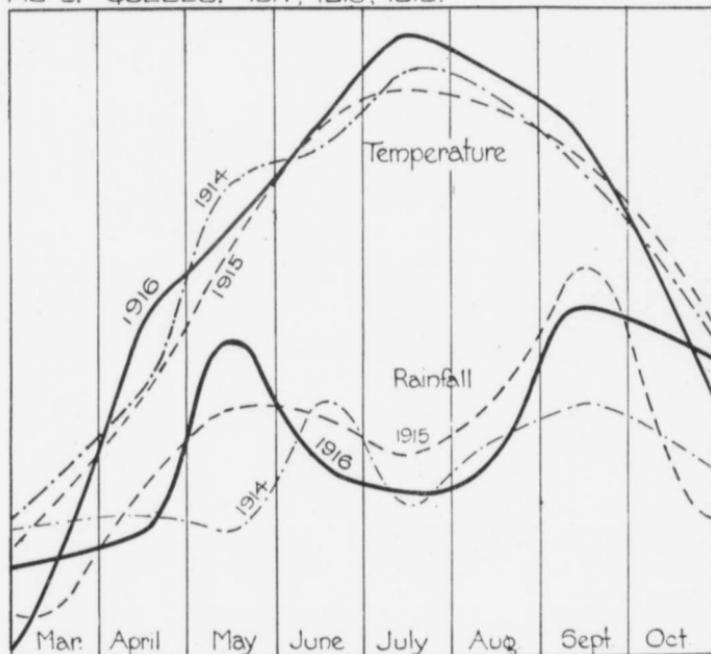
ONTARIO

The above diagram shows the temperature to have been comparatively high throughout the seasons of 1914 and 1915, while in 1916 it was low through May and June but excessively high in July and August. The rainfall in 1914 was comparatively light until August, making the fire season a serious one on the whole. The Department of Lands, Forests, and Mines reports the largest number of fires during that year of any of the last three years. In 1915, after a dry spring, the rainfall was heavy except during July. The department reports the smallest number of fires for that year, and states in regard to weather conditions that "the year was unusually favourable except for the first two months of the fire-ranging season."

In 1916, however, very extreme conditions were encountered with the well-known serious results in the Clay Belt region. The report of the Department of Lands, Forests, and Mines states that in the early part of August fires were reported from almost every part of northern Ontario. During the month of May and the first three weeks of June rain fell almost daily. During the last week of June the weather became extremely hot, and intense heat prevailed all through July and for the greater part of August, causing everything to become as dry as tinder. The early rains pre-

vented the settlers in the Clay Belt region from burning the brush on the areas of their farms that they had cleared, but as soon as the dry weather set in they began to set out fires to clear their lands. For a couple of weeks all went well, but during the last few days of July violent winds sprang up in the Timiskaming district, fanning the individual fires, driving them beyond control, uniting them into one seething cauldron of flame. The daily weather records of Iroquois Falls, one of the towns burned by the big fire, show that from July 14 to August 2 the temperature rose above 80 degrees every day, reaching a maximum of 106 degrees on July 29, the day on which the fire assumed its serious proportions. For seventeen days previous there had not been a drop of rain at that point. There was a light shower that day but no heavy rain until August 6, and not sufficient rain until the end of that month to render conditions entirely safe.

FIG. 8.- QUEBEC. 1914, 1915, 1916.

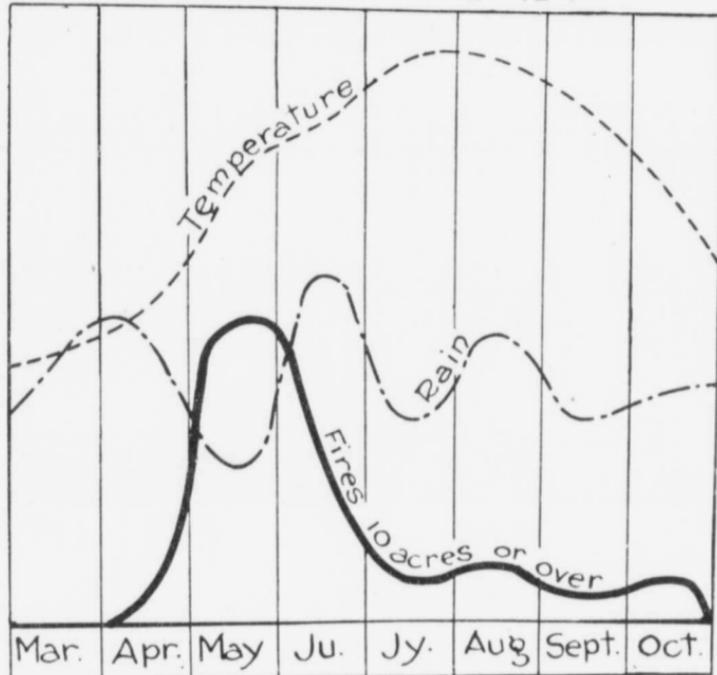


QUEBEC

The weather of northern Quebec naturally resembles that of northern Ontario each year, and the observations previously made in regard to the latter province apply also to Quebec. The year 1914 may be seen to have been comparatively dry, especially in April and May, and again in July. Conditions in 1915 were more favourable, but in 1916, after an early wet spell, the dry hot weather is shown by the diagram to have

been, in general, even more extreme than in Ontario. The serious results that might be expected were experienced in most of the province, but the success which attended the well-organized efforts of the co-operative forest protective associations in the St. Maurice and Lower Ottawa valleys, and which is brought out more fully in the latter portions of this bulletin, should be carefully noted.

FIG 9 - MARITIME PROVINCES. 1914



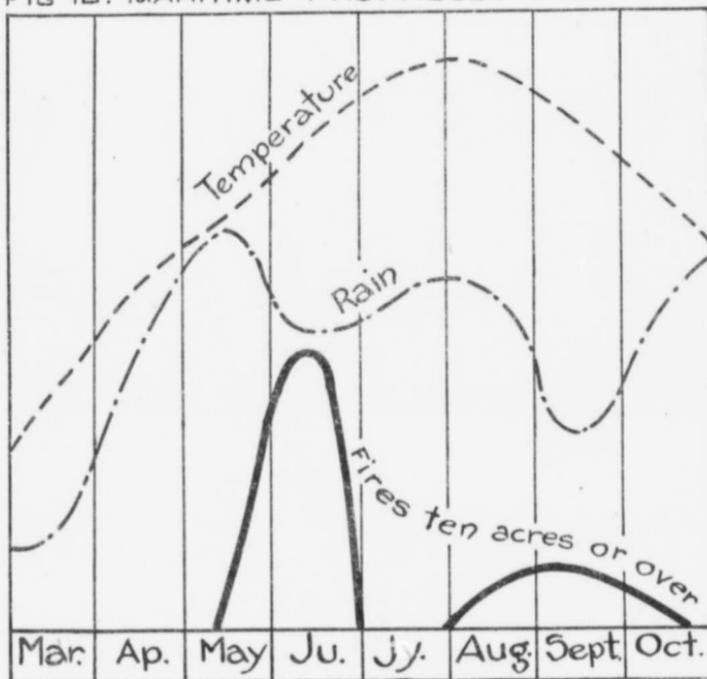
MARITIME PROVINCES

In the Maritime Provinces, 1914 was in general the most dangerous of the three seasons, 1914, 1915, and 1916. Not only was the number of fires greatest in that year, but the most damage was done. The danger period was confined mainly to May and the early part of June. By comparison with the two following diagrams it may be seen that the rainfall in May was less in 1914 than in either of the two following years. The rainfall in June was in the latter part of the month, so that a severe fire season resulted.

In 1915 there were two dangerous periods. The decreased rainfall in the latter part of August and in September is clearly shown in the diagram, and that brought on a number of not very extensive fires. A more severe fire season occurred at the end of May and the early part of June. The dangerous weather is not so clearly

indicated in the diagram as in the case of the latter danger period, because rains in the early part of May and the latter part of June bring up the totals for the months. Fires occurred rather generally throughout the two provinces but were not specially severe except in two new settlements in New Brunswick, known as the Hazen and Grimmer settlements. There, a situation developed very similar to that experienced in 1916 in the Clay Belt region in Ontario, which threatened to have proportionately serious results. The following account is taken from the report of the New Brunswick Crown Lands Department:—

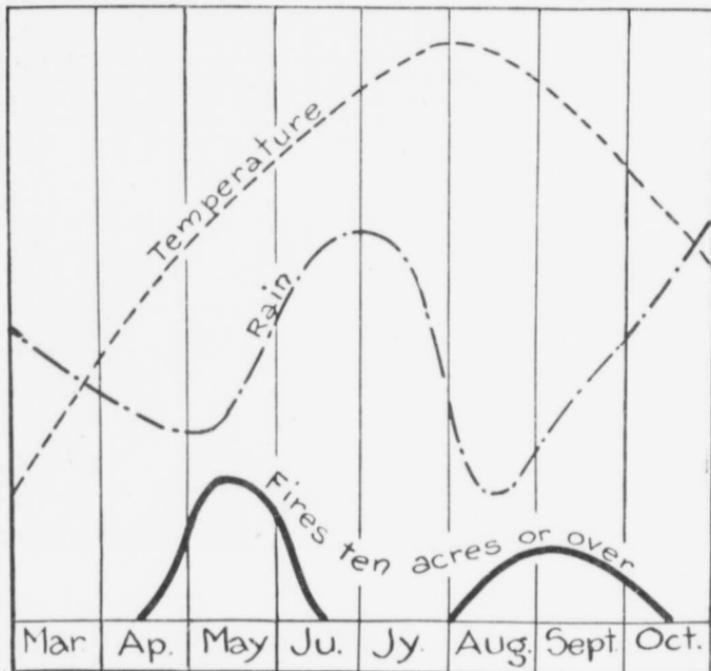
FIG 10. MARITIME PROVINCES. 1915.



"During the early spring and up to the end of May the weather was remarkably wet and stormy, so that fire conditions were conspicuously absent. About the end of May a sudden change took place, and before vegetation got a start conditions became critical. The first half of the month of June being very dry and exceedingly warm, many fires broke out in the province. On May 31 the settlers and squatters in Hazen and Grimmer settlements (of whom there were some 400 families) fired the heather simultaneously, having long waited for such a favourable opportunity. By June 2

the fire had spread everywhere through the settlements. It swept a distance of fifteen miles in length and on an average a mile wide. On June 12 rain fell and the immediate danger of a second Miramichi fire was averted."

FIG. 11. MARITIME PROVINCES. 1916.



The season of 1916 was favourable on the whole. Two dry periods occurred, one in May and the other in August and September. Both of these were comparatively short in duration, so that extensive damage was not done.

CAUSES OF FIRES

Weather conditions, the importance of which in relation to forest fires it has been the endeavour to illustrate, are not a cause of fires. The direct causes of fires are, at least theoretically, controllable, with the one exception of lightning. Detailed records of the causes of fires are available for the three years covered by this bulletin for the whole province of British Columbia, the three Prairie Provinces, for the mainland of Nova Scotia, and for a portion of Quebec, where the fire prevention is in the hands of

two very efficient co-operative associations of private timber holders. Incomplete statistics of the causes of fires in Ontario during 1914 and 1915 are also available. It should be noted, however, that of the fires included in the table, 91 per cent in 1914 and 65 per cent in 1915 were reported by rangers patrolling railway lines. Hence the large proportion of the fires reported as due to railways.

In presenting these data, the causes of fires have been grouped into seven main classes based upon the various classes of people to whom the importance of care with fire in the woods must be brought home. The object of the statistics is to show what classes of people are responsible for starting the larger number of fires, and therefore toward what classes the greatest efforts should be directed in the matter of education along the lines of fire prevention. The classification of causes has been made general so as to embrace factors met in almost every region. This allows the comparison of data from different regions. Fires of which the causes are not definitely ascertained, are grouped under the heading "Unknown." The percentage of fires placed in this class is to some extent an index of the intensiveness and efficiency of the fire-patrol. The percentage in this class should be gradually reduced in the course of time.

The chief causes of fire are: campers and travellers, settlers, railways, lightning, lumbering, incendiary, brush disposal, and "unknown." Under these the minor causes are grouped as shown below:—

Unknown.—Includes fires, the causes of which are not ascertained or not reported.

Campers and Travellers.—Includes fires started by any transient sojourners in the forest not employed on railways or in lumbering operations—tourists, fishermen, hunters, trappers, surveyors, timber cruisers, berry-pickers, and Indians travelling through or camping in the forest. Fires started by these classes of people arise mainly from smudges, camp fires, and smoking.

Settlers.—Includes mainly fires getting beyond control, that have been started for the purpose of clearing land for settlers (fallow fires). It also includes all fires started by settlers in their ordinary occupations near their homes or travelling between points in the settlement; and further, fires started from the burning off of hay sloughs. Indians occupying permanent homes are also included.

Railways.—Includes fire from sparks, hot ashes and coals from locomotives, smokers on trains, section-men burning ties and cleaning up right of way by burning off the grass; and all other fires started through employees of railways or persons travelling on trains. It includes also, fires connected with railway construction, sparks, etc., from steam shovels, burning brush during clearing of right of way, etc. It does not include fires started by tramps or other persons not employed by the railway walking along the right of way.

Lightning.—This is the one non-preventable cause of fires. The keeping of accurate records of the causes of fires has shown that more fires are caused by this agency, particularly in mountain regions, than was usually admitted previously. It has also been clearly shown that the remaining fires—over 90 per cent—are due to some form of human carelessness.

Lumbering.—Fires started in connection with any phase of lumbering operations, including the operation of saw-mills. Includes fires started from smudges, lunch-fires, etc., of lumberjacks, or river-drivers, dam and camp watchers; fire from lumber company employees smoking in the woods, sparks from donkey-engines, or saw-mill stacks. Does not include fires started by brush-burning operations.

Incendiary.—All fires started intentionally by any class of person.

Brush Disposal (not settlers clearing land).—Fires started from the burning of brush for the purpose of reducing fire danger. Does not include the burning of brush

for the purpose of clearing land, such as settlers' fallow fires. This class includes fires resulting from slash-burning operations on logged-off areas, which break beyond control, clearing of debris along roads or special fireguards, but not on railroad rights of way.

Other Causes.—Includes fires due to miscellaneous causes not falling into the classes outlined above, such as sparks from stacks of river steamers, burning buildings, etc.

The tables and diagrams are prepared on the basis of the total number of fires due to each cause. In studying causes it is not so much a matter of interest to know how many fires caused by each agency during the year become large fires, as this may be governed by weather conditions to a large extent. Statistics of the relative number of large and small fires due to each class of causes are available only for the Prairie Provinces and the Railway Belt in British Columbia. These show, for each of the main causes, that of the total number of fires the percentage of those spread beyond ten acres is approximately the same each season, and that at present, at least, it is impracticable to draw any general conclusions from them.

It should be stated in regard to railway fires, that during the whole period covered by this report, the regulations of the Board of Railway Commissioners were in effect on all lines under Dominion charter. The decrease in the percentage of fires due to railways brought about by the establishment of those regulations is, therefore, not shown, as it would be were earlier periods recorded. Also a large proportion of the fires herein shown as due to railways occurred along government-owned lines and lines under provincial charter which are not subject to the regulations. The statistics show, however, that under any circumstances the railways running through forested districts continue to be an important source of danger.

It will appear from the diagrams that the same causes are responsible for most of the fires, not only in each year but also in each of the regions.

TABLE I.—CAUSES OF FIRES,
BRITISH COLUMBIA

Year.	Unknown.		Campers.		Settlers.		Railways.		Lightning.		Lumbering.		Incendiary.		Brush Disposal.		Other Causes.		Total Number.
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		100 %
1914	537	25	622	25	272	17	487	26	251	16	67	3	56	3	11	*	111	5	2314
1915	285	19	432	29	329	22	136	9	150	16	61	4	31	3	26	5	33	3	1477
1916	215	19	332	36	175	15	153	13	116	16	85	8	24	2	14	1	23	2	1136

PRAIRIE PROVINCES
DOMINION LANDS—OUTSIDE FOREST RESERVES

1914	449	45	129	11	295	39	121	19	4	*	1	*	1	*	.....	42	4	1033
1915	349	31	392	36	136	13	187	17	7	1	1	*	.....	.....	29	3	1983	
1916	192	33	119	19	132	23	145	24	8	1	.....	.....	2	*	1	*	3	594

DOMINION FOREST RESERVES

1914	163	42	28	7	67	17	117	19	4	1	1	*	2	1	.....	8	2	390
1915	71	35	43	21	48	24	18	9	5	2	.....	11	5	4	.....	2	1	202
1916	11	29	6	16	6	16	7	18	2	2	4	11	1	3	.....	1	3	38

* Less than 0.5%.

TABLE 1.—CAUSES OF FIRES—*Concluded*

ONTARIO

INCOMPLETE STATISTICS, MOSTLY FIRES ALONG RAILWAYS

Year.	Unknown.		Campers.		Settlers.		Railways.		Lightning.		Lumbering.		Incendiary.		Brush Disposal.		Other Causes.		Total Number.
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1914.....	419	17	161	7	188	8	1593	67	.....	.....	.....	.....	.....	.....	.....	.....	26	1	2387
1915.....	70	1 $\frac{1}{2}$	100	2 $\frac{1}{2}$	51	1 $\frac{1}{2}$	2-3	5 $\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	9	1 $\frac{1}{8}$	486
1916.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1804

QUEBEC

ST. MAURICE AND LOWER OTTAWA VALLEYS ONLY

1914.....	71	19	38	10	153	39	60	15	19	5	38	10	.....	.....	.....	.....	.....	.....	379
1915.....	58	18	53	17	129	39	37	12	10	3	33	10	.....	.....	.....	.....	.....	.....	320
1916.....	98	28	66	19	22	6	90	25	37	11	4	2	.....	.....	.....	.....	.....	.....	348

NEW BRUNSWICK

1915.....	8	3 $\frac{1}{2}$	12	8	13	5 $\frac{1}{2}$	13	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26
1916.....	3	4 $\frac{1}{2}$	12	3 $\frac{1}{2}$	1	1 $\frac{1}{2}$	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7

NOVA SCOTIA

EXCLUSIVE OF CAPE BRETON ISLAND

1914.....	36	5 $\frac{1}{2}$	7	1 $\frac{1}{2}$	2	1	11	19	3	5	1	2	.....	.....	.....	.....	.....	.....	57
1915.....	18	5 $\frac{1}{2}$	3	5 $\frac{1}{2}$	3	3	7	22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32
1916.....	38	7 $\frac{1}{2}$	4	8	7	1 $\frac{1}{2}$	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	59

† Several small fires not included.

‡ Details not reported for 1916. Nearly 50% of fires reported said to be due to railways, with settlers as next most important cause.

Two definite observations may be made in connection with the diagram for Quebec. During 1914 and 1915, 40 per cent of the fires were caused by settlers, and in 1916 this percentage fell to 6 per cent. This was due to the inauguration of a settlers' burning permit law in 1916, and to the efficient administration of it by the two forest protective associations. In the district of the earlier established association not a single fire was caused by settlers in 1916. The co-operation of the settlers was sought, and at the end of the season the relations between them and the associations were better than before the permit law went into effect.

A similar reduction in the percentage of fires due to lumbering may be noted. The greater proportion of these were caused in the past by river-drivers. In 1916, in the St. Maurice valley, the companies forming the association did not allow the river-drivers to build smudges or to smoke outside of camp, and in that valley not a single fire was caused by them.

FIG. 12

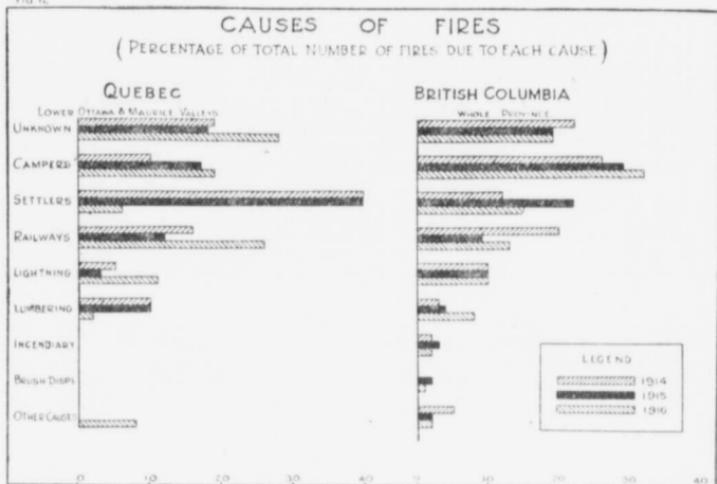
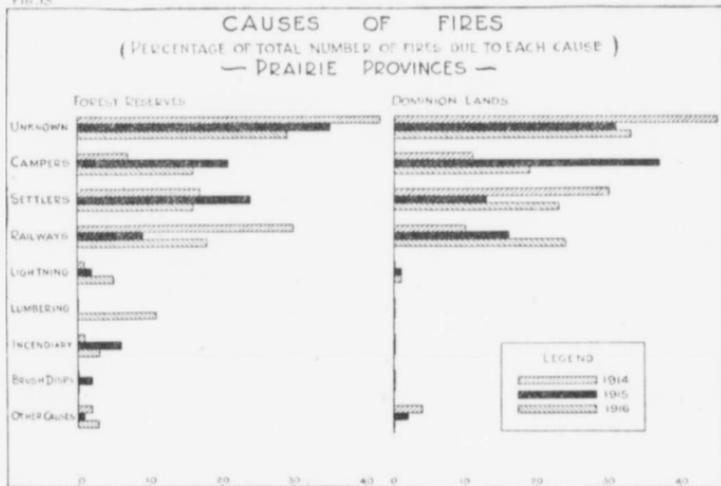


FIG. 13



PROSECUTIONS

TABLE 2.—SUMMARY OF PROSECUTIONS FOR INFRACOCTIONS OF FOREST FIRE LAWS

Year.	Jail Sentences	Fines Levied.		Suspend- ed Sentences.	Total Con- victions.	Cases Dis- missed	Total Cases.	
		No.	Amt.					
British Columbia†.....	1914	6	19	81,100	5	30	7	37
	1915		7	250	1	6		6
	1916	1			3	4		4
Prairie Provinces.....	1914		3	8 75	2	5	2	7
	1915	1	9	159		10	1	11
	1916		3	77		3		3
New Brunswick.....	1914							No report.
	1915		3	8 60		3	3	6
	1916							No report.
Nova Scotia.....	1914		Several *	Not stated			2	2
	1915		3	8 90		3		3
	1916		3*	50		3		3

* In 1914 damages were paid without suit in three cases. In two of these the damages amounted to \$6,000. In 1916 damages of small amount were paid in one case without suit.

† All on Provincial lands, outside of the Railway Belt.

Note: No data available for Ontario and Quebec.

NUMBER AND AREA OF FIRES

BRITISH COLUMBIA AND PRAIRIE PROVINCES

Table 3 is intended to show the severity of the three fire seasons in the four western provinces, both inside and outside the Dominion forest reserves. The statistics of the total number of fires, the number of large fires (those burning more than ten acres) and the total area burned over are given to illustrate this. As pointed out previously in connection with the weather charts, in British Columbia the season of 1914 was the worst; while in the Prairie Provinces, 1915 was the worst. The forest reserves in Alberta, however, came off lightly in 1915, but were hard hit in 1914 by a small number of very large fires which took place during a comparatively short but very dry spell.

The columns giving the percentage of large fires out of the total number of fires, and the average areas of large fires, have been added to illustrate in another way the comparative severity of the seasons. Naturally, in a dry season both of these factors tend to increase. The main value of these figures, however, is that when a comparison of them is made over a series of years for a given region they should serve as an index of the efficiency of the fire protection staff. The aim of any fire preventive organization is to put out, before they spread over more than ten acres, as large a proportion as possible of the total number of fires started. Also, it is the endeavour to keep down to the smallest possible area the size of the large fires. Thus a gradual decrease in

these two factors would indicate an increased efficiency. It will be observed, however, that there is a great irregularity in the factors tabulated here seemingly influenced more by weather conditions than by anything else. No earlier records are available to show what was the condition of things before the present state of efficiency of the fire prevention staffs in these provinces was reached, but, from knowledge available of some of the very destructive fires that have occurred, one may judge that a favourable showing would be made were it possible to make an accurate comparison. However, as far as the last three years are concerned, the period is too short and the various points to be considered are too numerous to permit many generalizations to be drawn.

Special comment should be made in connection with the percentage of large fires on provincial lands in British Columbia in 1914 and 1915. This percentage increased from 31 per cent in 1914 to 42 per cent in 1915, although the latter season was much less dangerous than the former. The reason for this is that on account of enlistments, and conditions brought about by the war, the patrol staff during the fire season was reduced in numbers from 302 to 202. Also a policy of retrenchment was followed in connection with the fighting of fires, the total cost being kept down to \$19,449 as compared with \$132,461 the year before. In addition to the percentage of large fires being increased the average area of the large fires was only 10 per cent less, although the total number of fires, on account of the less hazardous season, fell 44 per cent. The statement of the Chief Forester of the province in regard to this is: "From this season's (1915) statistics, it can readily be proven that fire-fighting is efficacious and does really reduce the fire damage."

As an illustration of the standards that it may prove possible to reach it may be stated that in District 1 (Northern Rocky Mountain region) of the United States Forest Service the standards that have been tentatively set as definite ideals towards which to work are: large fires not to exceed 15 per cent of total number of fires; and average area of large fires not to exceed 100 acres.

TABLE 3.—NUMBER AND AREA OF FIRES, BRITISH COLUMBIA AND PRAIRIE PROVINCES

	1914.				1915.				1916.						
	Total Number of Fires.	Fires over 10 Acres.			Total Number of Fires.	Fires over 10 Acres.			Total Number of Fires.	Fires over 10 Acres.					
		No.	%	Average Area.		Total Area.	No.	%		Average Area.	Total Area.	No.	%	Average Area.	Total Area.
BRITISH COLUMBIA.															
RAILWAY BELT—															
Forest Reserves.....	18	15	84	1,000	15,050	3	1	33	364	364	5	2	39	290	465
Dominion Parks.....	10	1	10	2,674	2,674	8	—	—	—	—	—	—	—	—	—
Dominion Lands.....	554	144	26	389	55,170	435	41	9	380	15,546	267	16	6	140	2,233
Total.....	582	169	28	455	72,894	446	42	39	380	15,910	273	18	7	140	2,638
PROVINCIAL LANDS.....	1,832	569	31	630	355,124	1,031	429	42	570	244,189	864	298	35	541	161,288
Whole Province.....	2,414	729	30	590	428,018	1,477	471	32	550	260,099	1,137	316	28	520	163,926
PRAIRIE PROVINCES.															
DOMINION PARKS, ALBERTA.....															
30						17	2	12	33,851	67,703	1				
FOREST RESERVES—															
Alberta.....	111	18	16	14,950	269,316	31	19	61	480	9,155	13	6	26	1,156	6,878
Saskatchewan.....	222	46	28	1,440	57,069	85	46	54	5,450	249,498	23	8	37	1,460	11,195
Manitoba.....	57	29	60	945	27,350	86	67	78	1,500	109,921	2	1	56	150	150
Total.....	390	87	32	1,680	354,725	202	132	65	2,710	359,574	38	15	29	1,210	18,223
DOMINION LANDS—															
Alberta.....	517	18	4	3,650	63,717	315	36	13	450	18,127	371	65	17	735	49,606
Saskatchewan.....	224	46	28	2,400	118,324	290	68	24	3,320	226,324	87	12	14	780	9,365
Manitoba.....	272	59	22	1,650	62,667	531	290	56	6,380	1,275,534	123	36	29	1,030	37,978
Total.....	1,013	123	12	1,960	241,138	1,066	398	26	4,920	1,519,985	581	113	19	840	95,419
WHOLE PROVINCES —															
Alberta.....	648	36	6	9,330	335,033	363	61	17	1,560	94,985	336	71	18	780	55,884
Saskatchewan.....	446	86	19	1,985	179,933	285	114	29	4,170	475,822	116	20	18	1,030	29,569
Manitoba.....	329	88	27	1,915	89,447	637	267	42	5,190	1,376,455	125	37	39	1,090	37,228
Total.....	1,423	210	15	2,810	595,413	1,285	442	33	4,410	1,947,262	631	128	21	890	113,672

FIG 14

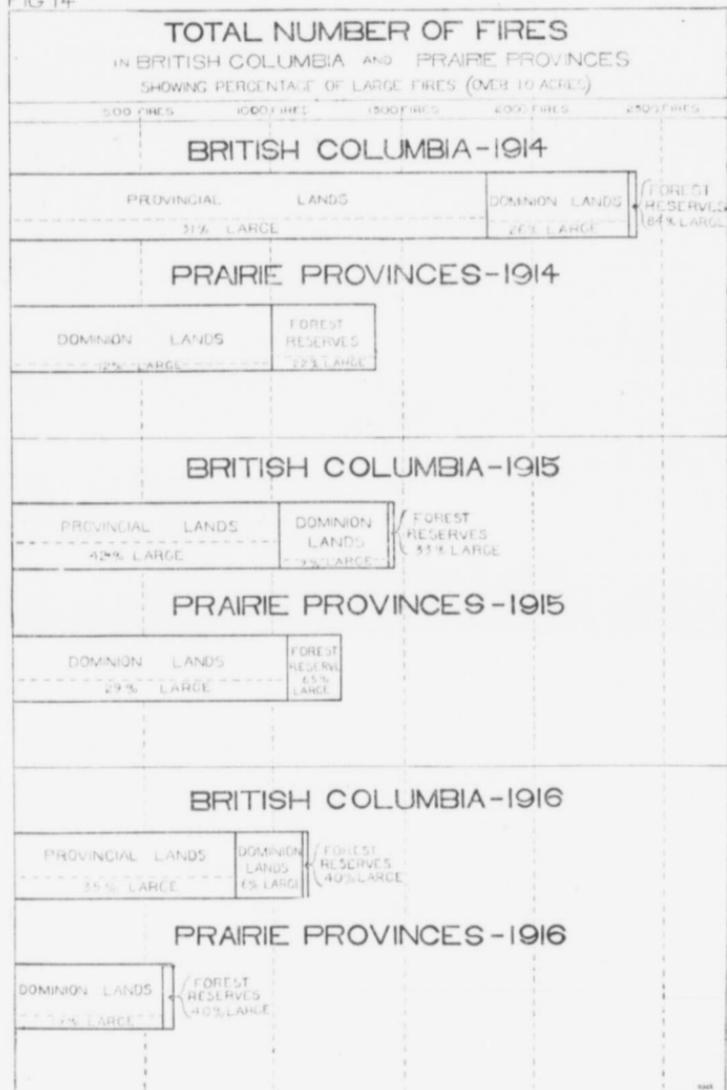
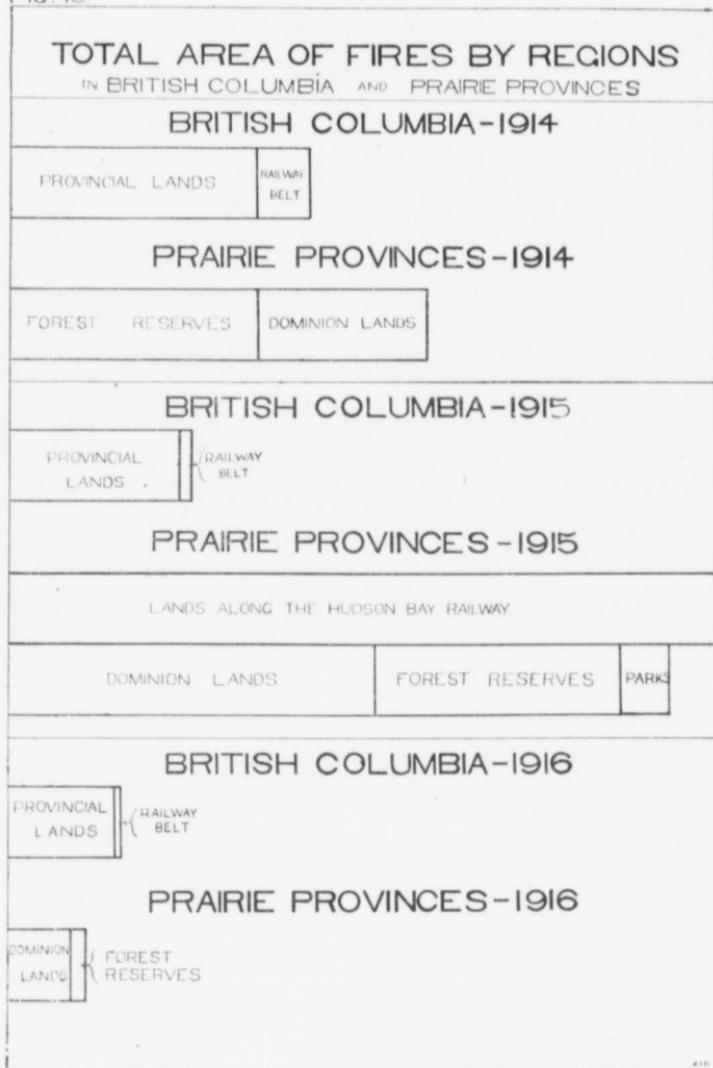


FIG. 15



As far as comparison of the various regions covered in the table is concerned, the only general point that is observable is that in the Prairie Provinces the average area of large fires is much greater than in British Columbia. This, however, is due more to the differences in the characters of the two regions than to anything else. In the Prairie Provinces, there is a larger proportion of grass land and flat, relatively open country where fires can spread broadcast at a rapid rate. The mountainous character of the country as well as the greater preponderance of heavily-timbered areas in British Columbia tend to reduce the areas of the fires.

A comparison of Figs. 14 and 15, representing the number of fires and the area burned over, will readily show how the larger average size of fires in the Prairie Provinces affects the total area burned over, making it much greater proportionally to the number of fires than in British Columbia. Thus in a very bad season such as 1915, when fires start readily and in large numbers, the area burned over becomes very great. This is true even when the immense burned area along the Hudson Bay railway in 1915 is left out of consideration.

ONTARIO

1914.—The total number of fires reported to the Department of Lands, Forests, and Mines was 2,387, exclusive of those occurring in the two provincial parks. Several bad fires are reported to have occurred in Algonquin park and two small fires in Quetico park. Of the 2,387 fires outside the parks, 91 per cent, or 2,181, were reported by the rangers patrolling railway lines, leaving only 206 fires for the rest of the province. Only 52 fires outside the parks are said to have caused damage to timber. Ten fires definitely reported in connection with railway lines in Ontario under the jurisdiction of the Board of Railway Commissioners for Canada burned 93,400 acres, while 94 fires along lines partly in Quebec and partly in Ontario burned 19,945 acres.

1915.—The total number of fires reported in this year was 486, distributed as follows: forest reserves, 52; unlicensed Crown lands, 61; licensed Crown lands, 56; railways, 317 (65 per cent of the total number). Seventy-seven of these fires are reported to have caused damage. The number of fires in the parks is not given, but it is stated that no damage was done. Of the railway fires 110 occurred along Dominion chartered railways, burning over 10,361 acres; the remaining 297 fires being reported by the rangers along the Provincial and Dominion Government lines.

1916.—The reports received in 1916 recorded 1,804 fires of which neither the distribution nor the area is stated. Of these fires 146 occurred along Dominion chartered railways, burning over only 4,100 acres, which is a remarkably good record considering the extent of fires in the rest of the province, and is a testimony to the benefits of efficient prevention measures. Only 125 of the total number of fires reported in the province are said to have been attended by any damage to timber. In addition to the above, there were several small fires in Algonquin park, which were put under control quickly. Three fires occurred in Quetico park; one, a small fire, another burning 80 acres, and the third spreading over a considerable area.

In the Clay Belt region fires occurred in four main districts. Apparently these all resulted from the merging of numerous settlers' fires which had broken beyond control. The areas of these fires are not reported even approximately. The largest fire was in the vicinity of Matheson and is stated to have burned through seven townships and parts of several others. It burned about thirty miles along the Timiskaming and Northern Ontario railway and eastward for several miles to the Abitibi river, in all an area of several hundred thousand acres would appear to have been burned.

Another fire of less magnitude burned around the town of Cochrane. The fire that destroyed the business section of the town started near its outskirts, but numerous other fires started at different points along the National Transcontinental railway and in townships north of it.

The third district in which fires occurred extended along the Transcontinental railway as far west as Hearst (130 miles from Cochrane), fires starting at several different points.

The fourth fire area was in the New Liskeard district, involving four townships.

QUEBEC

The forest fire statistics of the province of Quebec have in the past been summarized according to the government fiscal years, running from July 1 to June 30. This makes it impossible to give a statement of the fires occurring each season. It is understood that this practice is to be changed, which will be a distinct advantage. No statements of areas burned over are published by the province.

1914.—The total number of fires reported for the fiscal year 1913-14 is 899, distributed as follows: Crown lands, 571; private lands, 21; municipalities, 43; railways, 264. It is stated that very few of these occurred in 1913. The fires for the latter half of the season are included in the next year's report. No fires occurred in the Laurentides park during the year.

The reports of the co-operative associations, patrolling 16,000,000 acres out of the total area of 50,000,000 acres of licensed Crown lands, state that during the calendar year 1914 there occurred in their territory 385 fires of all sizes of which 154 burned over 298,000 acres.

1915.—The number of fires reported for the fiscal year 1914-15 is 667, of which 455 are classed as incipient fires. Of the remaining fires 88 were along railways and 124 on licensed Crown lands. The last group comprises the fires for the extinguishing of which expenditure was incurred, the Provincial Government being asked to pay a share of the cost. A bad fire is reported to have penetrated the Laurentides park from the outside, burning a strip two miles wide and eight miles long, of which five square miles were in the park. The report of the Department of Lands and Forests for 1915-16 does not contain the usual report on forest protection, so that no data are available in regard to the latter half of 1915.

The reports of the co-operative associations state that 320 fires occurred during the calendar year 1915, including all sizes. An area totalling 20,715 acres was burned over by about half of these. Of the remaining fires 49 necessitated the hiring of help to extinguish them, and one of these is reported to have burned 42,600 acres. One hundred and thirty fires occurred during the calendar year along Dominion chartered railroads, burning 2,286 acres.

1916.—As stated above, no statistics are available from the Department of Lands and Forests as to fires in the province as a whole during this year. It is known, however, that on account of the extremely dangerous season very bad fires occurred in many parts of the province, particularly in the Abitibi and Saguenay districts, the former being the Clay Belt region of Quebec. In spite of the bad season the two co-operative associations report only 28 more fires than during the previous year or a total of 348 fires of all sizes. Of these fires 148 burned over only 8,637 acres compared to 20,715 acres burned over by 155 fires in the same district the year before. Of the remaining 200 fires only 27 required the hiring of extra help. One of the main causes of this good showing was the efficient handling of the settlers' clearing fires under the newly enacted burning-permit law of the province.

Fifty-six fires are reported along Dominion chartered railways, burning 1,118 acres. Some of these were in the territory of the co-operative associations.

NEW BRUNSWICK

1914.—For this season 35 fires are reported. The total area burned over by 32 of them is reported as 8,660 acres. Only 3 fires burning less than ten acres are reported.

1915.—Twenty-six fires are reported; 21 burning 39,952 acres, while 5 were less than ten acres in extent. The area of the fire in the Hazen and Grimmer settlements, which is described more fully in an earlier portion of the bulletin, is stated to have been 22,980 acres.

1916.—Detailed reports of only 7 fires are given, but others which are said to have been extensive are mentioned in a general way. The 7 fires burned 1,467 acres, and 969 acres additional were burned in the Hazen and Grimmer settlements.

NOVA SCOTIA

1914.—This year was the worst fire season of the three seasons. Fifty-seven fires are reported on the mainland; 11 of them burned over 14,300 acres. The areas of 11 others are not reported but they are stated to have burned over considerable, and in several cases large areas. The number of fires is not complete, as the number of small fires, particularly, is not definitely stated for all counties.

1915.—For 1915 the definite reports mention 32 fires as having occurred. Twelve of these burned over 1,515 acres. Two others are stated to have burned considerable areas. The remainder are reported to have been mainly small in extent.

1916.—The total number of fires reported was 59, the area of 20 of them totalling 3,900 acres. Three others are stated to have burned considerable areas.

FIRES ALONG RAILWAYS UNDER THE JURISDICTION OF THE BOARD OF RAILWAY COMMISSIONERS

The statistics of the number of fires and acreage burned over along these lines during the past three years give striking evidence of the effectiveness of the regulations relating to prevention of fires that have been imposed, and to the efficiency of the enforcement of these regulations by the Chief Fire Inspector of the Board in co-operation with the organizations responsible for forest fire prevention in the various regions. The totals for the whole Dominion are as follows:—

1914—	Number of fires,	1,346;	area burned,	191,770 acres.
1915—	“	686;	“	37,263 “
1916—	“	558;	“	16,481 “

During this period the mileage of lines coming under the Board's jurisdiction increased materially.

DAMAGE TO FOREST GROWTH

BRITISH COLUMBIA AND PRAIRIE PROVINCES (EXCLUSIVE OF DOMINION PARKS)

Tables 4-A to 4-C give the statistics of the material damage done in the four western provinces during the past three years. These statistics are illustrated graphically in Figs. 16 and 17.

TABLE 4-A.—Areas of Timber and Young Growth Burned and Quantities of Timber Damaged in British Columbia and Prairie Provinces (exclusive of Dominion Parks) in 1914.

	Merchantable Timber and Cordwood.			Young Growth.	Non-Merchantable.	Total Area.
	Acres.	M Ft. B.M.	Cords.	Acres.	Acres.	Acres
BRITISH COLUMBIA						
RAILWAY BELT.						
Forest Reserves	1,370	530	.....	43,680	.....	15,050
Dominion Lands	8,695	39,937	.....	21,238	25,237	55,179
Total	10,065	40,467	.....	34,918	25,237	70,220
PROVINCIAL LANDS	42,549	118,692	.....	38,402	254,173	355,124
Whole Province	52,614	159,069	.....	93,320	279,410	425,344
PRAIRIE PROVINCES						
FOREST RESERVES.						
Alberta	110,332	448,953	280,000	48,249	110,735	269,316
Saskatchewan	2,420	272	31,645	38,974	16,215	57,609
Manitoba	4,795	65	28,065	6,653	15,902	27,350
Total	117,547	449,290	339,710	93,876	142,852	354,275
DOMINION LANDS						
Alberta	25,972	1,192	9,400	14,560	25,185	65,717
Saskatchewan	2,519	168	20,800	22,611	88,194	113,324
Manitoba	7,329	13,577	32,042	35,179	19,579	62,697
Total	35,830	14,937	72,242	72,350	132,958	241,138
WHOLE PROVINCES.						
Alberta	136,304	450,145	289,400	62,809	135,920	335,033
Saskatchewan	4,939	440	62,445	61,585	104,409	170,933
Manitoba	12,124	13,642	60,107	41,832	35,481	89,447
Total	153,377	464,227	411,952	166,226	375,810	595,413

TABLE 4-B.—Areas of Timber and Young Growth Burned and Quantities of Timber Damaged in British Columbia and Prairie Provinces (exclusive of Dominion Parks) in 1915.

	Merchantable Timber and Cordwood.			Young Growth.	Non-Merchantable.	Total Area.
	Acres.	M Ft. B.M.	Cords.				Acres.	Acres.
BRITISH COLUMBIA.						
RAILWAY BELT.						
Forest Reserves	182	19	36	182	.....	364
Dominion Lands.....	439	2,516	275	2,156	12,951	15,546
Total.....	621	2,529	306	2,338	12,951	15,910
PROVINCIAL LANDS.	30,310	187,969	.....	13,317	296,562	244,189
Whole Province	30,931	190,438	305	15,655	213,513	260,099
PRAIRIE PROVINCES.						
FOREST RESERVES.						
Alberta.....	4	1	.....	512	8,239	9,155
Saskatchewan.....	21,699	60,160	796,720	54,797	173,492	249,498
Manitoba.....	21,963	10,434	275,470	39,583	39,375	160,921
Total	43,576	70,535	1,072,190	95,792	220,706	359,574
DOMINION LANDS.						
Alberta.....	1,298	6,230	175,600	3,669	13,839	18,127
Saskatchewan.....	25,016	17,282	284,966	64,367	137,491	226,324
Manitoba.....	51,968	106,625	883,430	121,622	101,964	274,834
Hudson Bay Railway....	552,320	281,904	338,000	62,200	386,180	1,080,760
Total	630,532	412,041	1,681,426	250,529	638,924	1,519,985
WHOLE PROVINCES.						
Alberta.....	1,292	6,231	175,600	3,912	22,078	27,282
Saskatchewan.....	46,625	77,382	1,081,716	119,164	310,683	475,822
Manitoba.....	73,871	117,059	1,158,900	160,605	141,279	373,755
Hudson Bay Railway....	552,320	281,904	338,000	62,200	386,180	1,080,760
Total	674,108	482,576	2,753,516	345,821	859,620	1,879,559

TABLE 4-C.—Areas of Timber and Young Growth Burned and Quantities of Timber Damaged in British Columbia and Prairie Provinces (exclusive of Dominion Parks) in 1916.

	Merchantable Timber and Cordwood.			Young Growth.	Non-Merchantable.	Total Area.
	Acres.	M Ft. B. M.	Cords.	Acres.	Acres.	Acres.
BRITISH COLUMBIA.						
RAILWAY BELT.						
Forest Reserves	30	13	.....	25	350	405
Dominion Lands.....	97	365	.....	54	2,082	2,233
Total	127	378	.....	79	2,432	2,638
PROVINCIAL LANDS..	15,304	50,415	.....	11,278	134,706	161,288
Whole Province.....	15,431	50,793	.....	11,357	137,138	163,926
PRAIRIE PROVINCES.						
FOREST RESERVES.						
Alberta	35	280	10	225	6,618	6,878
Saskatchewan.....	975	.....	100	50	10,130	11,195
Manitoba.....	52	.....	.....	.....	98	150
Total	1,062	280	110	315	16,846	18,223
DOMINION LANDS.						
Alberta	3,872	1,630	16,020	4,752	40,382	49,006
Saskatchewan.....	225	.....	500	2,480	6,669	9,365
Manitoba.....	1,055	2,685	41,034	13,058	22,965	37,078
Total	5,152	4,315	57,554	20,290	70,007	95,449
WHOLE PROVINCES.						
Alberta	3,907	1,910	16,030	4,977	47,600	55,884
Saskatchewan.....	1,200	.....	600	2,570	16,790	20,560
Manitoba.....	1,107	2,685	41,034	13,058	23,063	37,228
Total	6,214	4,595	57,664	20,605	86,853	113,672

Fig. 16 shows the relative area of merchantable timber and cordwood, of young growth, and of areas without either, that were burned. It will be noted that the merchantable timber area burned over, while of very considerable extent in the aggregate, represents only a comparatively small proportion of the total area. This is due in part, of course, to greater efforts properly being made to protect the merchantable areas. It is also due, however, to the fact that usually a fire spreads less rapidly in heavy green timber than on other areas, and also to the fact that past fires have reduced the area of merchantable timber very seriously and increased the proportion of areas of other classes. The larger proportion of the total burned area classified as young growth or as land without either merchantable timber or young growth should not be a cause for congratulation, but on the contrary it should be a serious reminder of the past ravages of fires.

It should be noted also in connection with this diagram that the continual destruction of young growth is one of the most serious effects of forest fires, often exceeding in value of damage done the injury to merchantable timber.

Fig. 17 illustrates the quantity of saw-timber damaged each season. The diagrams do not illustrate as accurately as those showing the number and areas of the fires, the relative severity of the different seasons. The quantity of merchantable timber burnt in a season depends, to a certain extent, on chance as to where fires may happen to

FIG 16

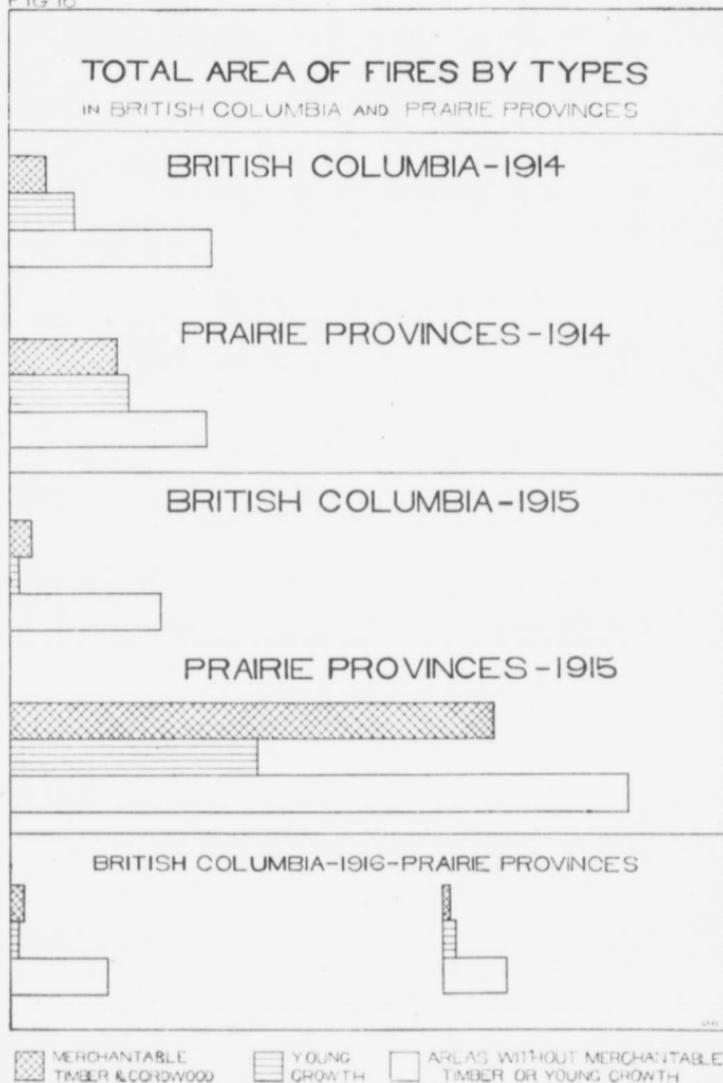
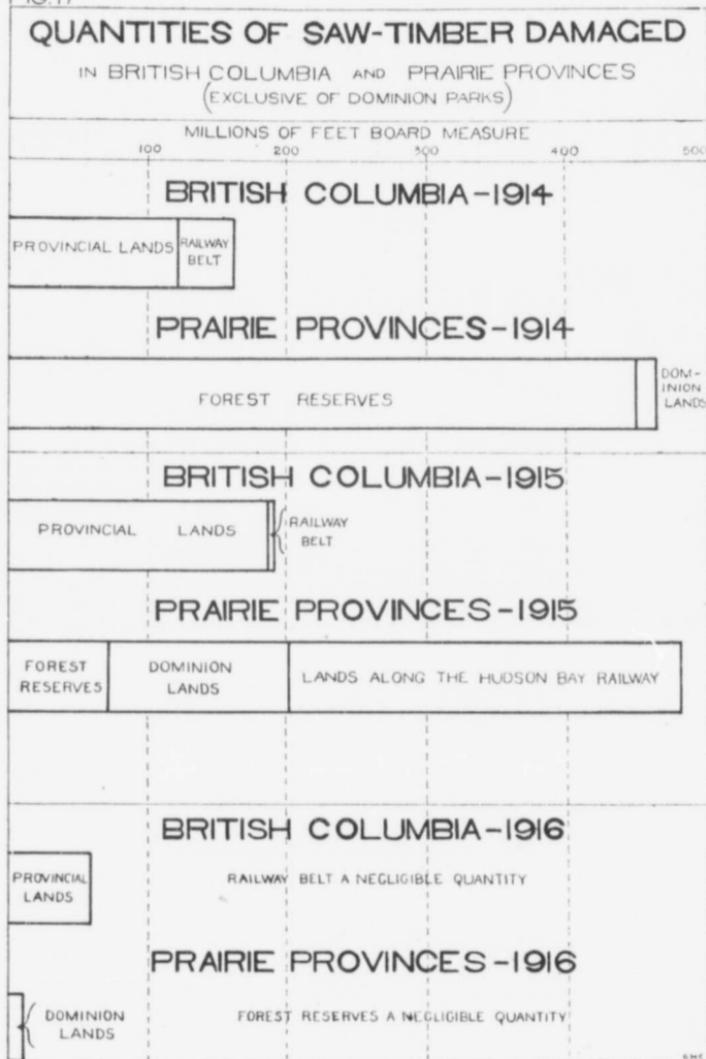


FIG. 17



start. A relatively few fires generally burn the greater proportion of the total quantity of timber damaged. A fire started by lightning or a camper's fire in an inaccessible body of heavy timber may do more damage to timber than any of the other fires of the year. In a wet season, such as was 1916 in the western provinces, the quantity of timber burnt is likely to be less, proportionately to the other seasons, than is the total area burned over during the wet season to that burned in an average season. The ground dries out less in the heavy timber so that fires will spread there with difficulty, while the more open areas such as grass land, old "burn," slash, etc., may dry out during a short dry spell and considerable areas be burned over. This is illustrated by the almost negligible quantities of timber destroyed in these regions in 1916.

EASTERN PROVINCES

As in no cases are systematic statistics published of areas burned over, giving separately the areas of merchantable timber, young growth, and other classes of land, it is impossible to do more than quote from the various published reports the usually vague statements of the damage done by forest fires. These may give a partial idea of the extent of the destruction caused. For the most part, however, reference is made only to merchantable saw-timber. There is left out of consideration the material of cordwood size, which might have had a considerable value in the future for pulpwood or for settlers' use; the young trees killed in merchantable stands which might have been counted on to perpetuate the forest; and the young growth of old "burns," slashings, etc.

ONTARIO

1914.—Considerable timber was burned in the Mississauga forest reserve necessitating the sale of several timber berths to secure its immediate salvage. Considerable timber was damaged in Algonquin Park, and was offered for sale but without success. Fifty-six other fires are reported to have caused damage to timber. The only statement in regard to the damage caused by the fires on unlicensed lands is that from 1,500,000 to 2,000,000 feet board measure of pine was damaged, together with considerable quantities of young pine, birch, spruce, and basswood. No statement is made in regard to damage caused on licensed lands, except that three of the fires caused an especially large amount of damage.

Of the 93,400 acres burned along Dominion chartered railways in Ontario alone, 68,205 acres are classed as timberland and 24,637 acres as young growth. Along the railways partly in Ontario and partly in Quebec, 5,700 acres of timber and 3,500 acres of young growth were burned, out of the total area of 19,045 acres.

1915.—Damage to merchantable timber is reported to have been caused by 77 fires, five of these being mentioned as specially serious and some others as having injured a considerable quantity of pine. No damage was done by fires in Algonquin and Quetico parks. Timberland to the extent of 1,976 acres and 4,535 acres of young growth was burned along Dominion chartered railways, as a result of 110 fires. The damage caused by the 207 fires along other lines is not reported.

1916.—Data in regard to the losses to forest growth caused by the terrific fires of this season are entirely lacking in the official reports. Only 125 out of the total number of 1,804 fires reported are said to have caused any damage to timber. Thirteen of these are mentioned as having occasioned the greatest damage.

Of the 4,100 acres burned over along Dominion chartered railways there were 679 acres of timber, 656 acres of young growth, 2,612 acres of slash or old "burn," and 153 acres of other classes of lands.

QUEBEC

No details of the areas burned over are reported by the Provincial Department of Lands and Forests nor by one of the two associations of private limit holders, except

that the latter mentions one fire in 1915 as having burned over approximately 35,000 acres of green timber (out of a total of about 42,000 acres), and another fire in 1916 which burned 449 acres of merchantable timber. The other association reports that on total burned areas of 297,996 acres in 1914, 20,715 acres in 1915, and 8,637 acres in 1916 there were burned 16,624,325 feet board measure, 6,607,450 feet board measure, and 858,620 feet board measure, respectively. The material reductions in these figures are particularly noteworthy when it is borne in mind that these were the first three years of operation of the association and more especially that in 1916, the year in which the least damage was done, the season was the most dangerous and the greatest damage was done in the rest of the province. One large limit holder reported the loss of 35,000,000 feet board measure from two fires reaching his limits in an uncontrollable state.

MARITIME PROVINCES

1914.—No details of the damage done by the fires in New Brunswick, which are reported to have burned over 8,660 acres, are given in the provincial report.

In Nova Scotia the references in the chief rangers' reports are very vague. Four fires are mentioned as having burned over considerable areas of timber, and nine others as having burned smaller areas of timber and young growth. For a large proportion of the fires burning over considerable areas no details of the damage done are given.

1915.—The serious fire that burned 22,980 acres in the Hazen and Grimmer settlements in New Brunswick is reported to have burned 183,320 cords of pulpwood, 1,925,000 feet board measure of merchantable spruce, balsam, and cedar. Details are lacking as to the damage done by the other fires that season, which are reported to have burned an area of 16,072 acres.

A report of 2,000 acres of green timber burned is the only definite report of a large area of timber having been burned in Nova Scotia. Five other fires are reported to have burned a total area of 565 acres of timber.

1916.—In the report for New Brunswick for this year a general statement that the damage was slight is given. Of the 1,467 acres covered by detailed reports, 400 acres are stated to have been merchantable saw-timber and the remainder mostly pulpwood.

The report for Nova Scotia indicates that slight damage to merchantable timber was done. The damage done by the fires, the definite area of which, totalling 3,900 acres, is reported, appears to have been mainly to young growth.

DESTRUCTION OF LIFE AND PROPERTY

BRITISH COLUMBIA AND PRAIRIE PROVINCES

Table 5 hereunder gives the estimated value of private property destroyed in the four western provinces. The value of standing timber and young growth destroyed is not included in this table.

TABLE 5.—Property Destroyed in British Columbia and Prairie Provinces
(Exclusive of Dominion Parks)

	1914	1915	1916
BRITISH COLUMBIA.	\$	\$	\$
Railway Belt	2,732	6,465	199
Provincial Lands Forest Products.....	291,733	10,546	2,980
" Buildings.....	137,595	29,746	18,396
" Equipment	11,076	12,825	3,808
" Miscellaneous.....	14,077	4,963	1,778
Total Provincial Lands.....	364,475	57,774	26,962
Whole Province	367,207	64,239	27,161
PRAIRIE PROVINCES	4,925	4,617	10,337

ONTARIO

In 1914 the camps and supplies of a lumber company were burned, a value of \$10,000 being placed on them. Five ranger cabins were burned in Algonquin park.

In 1915 the effects of thirteen settlers in the Port Arthur district were destroyed.

In 1916 there was widespread damage to property in the Clay Belt region. No reports of the destruction of property in the other parts of the province are available. The Matheson fire is reported to have burned practically everything in its course—settlers' homes and crops, the villages of Kelso, Nushka, part of Porquis Junction, part of Iroquois Falls (including part of the plant of the Abitibi Power and Paper Company), and the whole of the town of Matheson. In the latter place were located the storehouse, office, and part of the plant of the Northern Development Branch of the Department of Lands, Forests and Mines, which were among the properties destroyed. At Cochrane the business portion of the town was completely destroyed. Beyond the limits of the town a large number of settlers lost their buildings and crops. The fires occurring farther west in the direction of Hearst burned out several settlers. In the New Liskeard district two mining companies suffered loss, as did a number of settlers.

The Provincial Fire Marshal reports for the Clay Belt region that 849 people suffered losses aggregating \$2,134,349. The losses were distributed, in part, as follows:—

Cochrane.—People affected, 203; losses, \$960,000.

Matheson.—People affected, 51; losses, \$126,000.

Iroquois Falls.—People affected, 31; losses, \$316,000.

New Liskeard District.—People affected, 124; losses, \$254,000.

Settlers in other districts.—People affected, 345; losses, \$300,000.

Pulpwood ready for delivery, value \$63,600

At Iroquois Falls a large part of the loss was sustained by the Abitibi Power and Paper Company, and in the New Liskeard district by the Casey Cobalt Silver Mine and the Croesus Mine. Nearly half the total loss was covered by insurance, but the amount of insurance held by the settlers and the residents of Matheson was negligible.

The Department of Lands, Forests and Mines report states that the fires near Matheson, Cochrane, and Hearst burned culverts, corduroy, and small bridges on the trunk roads constructed by the province, making necessary much new construction and re-grading. The loss in connection with the roads would not appear to be included in the Fire Marshal's report.

The number of lives lost in connection with these fires is the most serious feature of them. In the Hearst district no casualties were reported, but in the New Liskeard region there were twelve casualties, and in the Matheson fire the staggering total of 224 people* were burned to death, and on that account the last named will go down in history as one of the most disastrous forest fires. Only two fires have been recorded with a greater loss of life, viz.: the Peshtigo fire, in the Green Bay region of Wisconsin in 1871, when 1,500 lives were reported lost, and the Hineckley fire in Minnesota in 1894, when 418 lives were lost. Only five other fires are recorded as having caused the loss of over twenty lives. These, with the years in which they occurred, are as follows:—

- (1) 1825, the Miramichi fire in New Brunswick, 160 lives lost.
- (2) 1881, the Michigan fire, 138 lives lost.
- (3) 1910, the great Idaho fire, 85 lives lost.
- (4) 1910, the Beaudette-Rainy River fire, which swept both sides of the Minnesota-Ontario boundary, 42 lives lost.
- (5) 1911, the Porcupine fire of northern Ontario, 70 lives lost.

ADMINISTRATION OF FIRE PROTECTION

Tables 6, 7, and 8 give in summarized form figures of the patrol staffs maintained in the western provinces and in Ontario, the areas patrolled by them, and the permanent improvements each season. The number of men in the patrol staff includes all those whose duties are directly connected with fire prevention and who are regularly employed during a considerable portion of the fire season. It includes the men supervising the field work as well as the rangers, but no head office officials or clerks. The number of year-long employees is shown separately so as to indicate what proportion of the field staff is permanent, as this is an important factor in securing the greatest efficiency. It was not possible to give this for Ontario, where a certain number of men are engaged in the winter in connection with other branches of the work of the Department of Lands, Forests and Mines. Most of the rangers, however, are employed only during the fire season.

The number of ranger districts, where indicated, is always smaller than the total staff, on account of the chief rangers and lookout men having no special districts and on account of two men patrolling together in many cases, especially where canoes are the means of travel.

The figures of areas patrolled are in most cases more or less approximate. The area of Dominion lands in the Prairie Provinces includes the Peace River block and Dominion Government coal lands in British Columbia. The area of licensed timber

*This is the latest figure obtainable. Earlier statements gave 264 as the number burned to death.

berths is included in the areas of Dominion parks, Dominion forest reserves, and Dominion lands. In Ontario the areas of forest reserves and parks include licensed lands the area of which is also included in the total area of licensed lands.

The statement of the cost of patrol includes only government expenditure except in the case of licensed lands in Ontario where the licensees had to bear the whole cost, the estimated amount of which is given. The cost of relief work in Northern Ontario in 1916 is, also, not given. A fund of \$250,000 was privately subscribed and the Provincial Government spent a large amount. A number of rangers are employed by individual timber owners in British Columbia, but the number of rangers and cost of service are not obtainable. The cost of patrol along Dominion chartered railways in accordance with the regulations of the Board of Railway Commissioners is not known. The extent of the patrol required is outlined on page 45.

In the cases of parks and forest reserves in all provinces the total cost of patrol during the fire season is given, but the time of the staff is to a certain extent during that season devoted to administrative work and game protection. This is offset by the fact that during the remainder of the year a considerable portion of the time of the year-long employees is devoted to the construction of improvements undertaken to increase the facilities for preventing fires. In the case of the Ontario provincial parks, the whole cost of administration throughout the year is given, as it was impracticable to subdivide it. In all other cases there is considerable expenditure besides that shown in the tables, for administration, game protection, etc.

The cost of fire-fighting is likewise incomplete. Not only is it impossible to give a statement of the value of volunteer labour engaged in fighting fires, but the expenditure of private timber owners and licensees is not known. In Ontario licensees pay the whole cost of fire-fighting, and licensees of Dominion timber berths in the four western provinces are required by the terms of their licenses to assist in extinguishing fires starting on, or threatening their berths. The Dominion chartered railways must also bear the expense of putting out fires for which they are responsible.

The expenditure figures given in the tables, therefore, do not represent the total amount spent on fire protection, and it is evident that it will continue to be impracticable to secure complete figures.

The expenditures by the various government agencies are in some cases refunded by timber owners or collected from them, rather than from the people as a whole, by means of a direct tax on timber lands. In British Columbia, the Provincial Government collected for the "Forest Protection Fund" \$122,341 in 1914, \$114,785 in 1915, and \$103,580 in 1916. This tax is levied on the basis of $1\frac{1}{2}$ cents per acre on all timber lands owned or licensed. The Dominion Government requires timber licensees to pay half the actual cost of protection on their berths, the rate of assessment varying from year to year. Railways under construction are also required to pay half the cost of patrols along their rights of way. Collections on these accounts were \$20,060 in 1914, \$29,778 in 1915, and \$18,091 in 1916.

The cost of permanent improvements given in the last columns of the tables includes expenditure for rangers' houses and cabins, stables and other buildings, look-out towers, telephone lines, roads, trails, bridges, fireguards, and similar work. The cost of equipment is included in most cases. In the table for Ontario the cost of fire-fighting is included in the cost of patrol except where separately stated but the greater portion of the expenditure is in all cases for patrol, although some improvements and equipment were paid for from the amounts reported. Many of the improvements have value for administrative purposes but the main purpose of nearly all of them is to make the prevention of fires more efficient and economical.

TABLE 6.—British Columbia—Areas Patrolled, Government Staffs and Expenditures

	Staff.			No. of Districts.	Areas.		Expenditures.				
	Year Long.	Temporary.	Total.		Average Area of Districts.	Total Area Patrolled.	Cost of Patrol per Acre.	Total Cost of Patrol.	Fire Fighting.	Improvements.	Total Expenditure.
					Acres.	Acres.	cts.	\$	\$	\$	\$
1914.											
RAILWAY BELT.											
Forest Reserves	8	6	14	9	194,000	1,750,718	0.46	8,030	6,497	8,968	23,495
Dominion Parks	1	9	10	9	80,000	718,720	0.22	1,560	9,521	3,689	14,770
Dominion Lands	2	57	59	56	110,000	6,181,000	0.83	52,784	39,128	4,419	96,331
Railways	2	2	2	...	...	...	...	1,725	...	...	1,725
Total	11	74	85	74	117,000	8,650,438	0.74	64,099	55,146	17,076	136,321
PROVINCIAL LANDS.											
Forest Reserves .....	...	...	...	...	...	64,000	...	...	...	...	...
Crown Lands	51	307	358	302	499,000	149,936,000	...	...	...	...	...
Railways .....	...	49	49	...	...	...	...	...	...	...	...
Total	51	356	407	302	499,000	150,000,000	0.15	228,352	143,461	31,385	403,198
Grand total	62	430	492	376	422,000	158,650,438	0.18	292,451	198,607	48,461	539,519
1915.											
RAILWAY BELT.											
Forest Reserves	11	2	13	10	175,000	1,750,718	0.52	9,104	29	22,438	31,571
Dominion Parks	1	8	9	8	90,000	718,720	0.33	2,342	66	3,758	4,165
Dominion Lands	2	57	59	56	110,000	6,181,000	0.83	51,274	6,172	7,530	64,976
Railways	2	2	2	...	...	...	...	2,482	...	...	2,482
Total	14	69	83	74	117,000	8,650,438	0.75	65,202	6,267	33,726	105,195
PROVINCIAL LANDS.											
Forest Reserves .....	...	...	...	...	...	64,000	...	...	...	...	...
Crown Lands	54	203	237	202	743,000	149,936,000	...	...	...	...	...
Railways .....	...	2	2	...	...	...	...	...	...	...	...
Total	54	205	239	202	743,000	150,000,000	0.11	157,432	19,449	5,151	182,032
Grand total	68	274	342	276	575,000	158,650,438	0.14	222,634	25,716	38,877	287,227
1916.											
RAILWAY BELT.											
Forest Reserves	11	10	21	10	175,000	1,750,718	0.70	12,153	103	21,073	33,329
Dominion Parks	2	7	9	8	90,000	718,720	0.32	2,320	20	2,353	4,693
Dominion Lands	2	59	61	58	107,000	6,181,000	0.84	52,131	953	5,190	58,274
Railways	2	2	2	...	...	...	...	2,518	...	...	2,518
Total	15	78	93	76	114,000	8,650,438	0.80	69,122	1,076	28,616	98,814
PROVINCIAL LANDS.											
Forest Reserves .....	...	...	...	...	...	64,000	...	...	...	...	...
Crown Lands	41	191	232	186	806,000	149,936,000	...	...	...	...	...
Railways .....	...	2	2	...	...	...	...	...	...	...	...
Total	41	193	234	186	806,000	150,000,000	0.09	143,203	8,776	4,228	156,206
Grand total	56	271	327	262	665,000	158,650,438	0.13	212,325	9,851	32,844	255,070

ADMINISTRATION OF FIRE PROTECTION

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TABLE 7.—PRairie PROVINCES—AREAS PATROLLED, GOVERNMENT STAFFS AND EXPENDITURES.

	Staff.			Ares.		Expenditures.				
	Year Long.	Temporary.	Total.	Average Area of Districts.	Total Area Patrolled.	Cost of Patrol per Acre.	Total Cost of Patrol.	Fire Fighting.	Improvements.	Total Expenditures.
1914										
Forest Reserves.....	72	34	106	83	285,000	23,712,922.0-31	73,304,390,629	75,884	179,927	254,811
Domination Parks.....	23	8	31	139	109,000	1,912,480.0-72	13,829	620	19,272	33,734
Domination Lands.....	6	131	137	110	1,200,000	132,000,000.0-07	91,861	3,265	2,315	97,571
Railways.....	1	6	7	.....	.....	.....	5,128	.....	221	5,349
Total.....	102	179	281	212	714,000	157,624,682.0-12	184,222,314,574	97,703	216,601	314,304
1915										
Forest Reserves.....	98	31	129	98	217,000	21,273,922.0-42	88,295,28,647	97,646	214,088	311,734
Domination Parks.....	25	9	34	22	198,000	4,250,560.0-44	18,291	1,379	14,729	35,109
Domination Lands.....	8	134	142	110	1,200,000	132,000,000.0-08	99,824	11,591	3,699	114,514
Railways.....	1	14	15	.....	.....	.....	10,039	147	1,254	11,940
Total.....	132	188	329	230	717,000	157,624,682.0-14	217,619,41,764	116,738	276,131	393,817
1916										
Forest Reserves.....	108	47	155	107	199,000	21,273,922.0-47	90,847	130	90,298	190,335
Domination Parks.....	29	3	32	23	180,000	4,250,560.0-44	19,133	487	12,622	31,652
Domination Lands.....	11	171	182	126	1,047,000	132,000,000.0-60	107,743	2,710	1,626	112,079
Railways.....	3	17	20	.....	.....	.....	14,727	.....	1,635	15,792
Total.....	151	238	389	256	616,000	157,624,682.0-13	241,439	3,357	161,991	316,828

TABLE 8.—ONTARIO—AREAS PATROLLED, STAFFS AND EXPENDITURES

1914	Staff	Area Acres	Expenditure
			\$
Forest Reserves	225	11,754,240	87,101
Provincial Parks	58	2,714,000	22,524
Railways	243		
Unlicensed Crown Lands	111		145,558
Licensed Crown Lands	328	10,893,120	* 90,000
Total	965		345,183
1915			
Forest Reserves	177	11,754,200	67,414
Provincial Parks	57	2,714,000	31,954
Railways	144		56,326
Unlicensed Crown Lands	113		49,925
Licensed Crown Lands	294	10,893,120	* 75,000
Total	785		280,619
1916			
Forest Reserves	197	11,754,200	86,967
Provincial Parks	57	2,714,000	32,972
Railways	146		
Unlicensed Crown Lands	123		106,118
Licensed Crown Lands	298	10,655,840	* 80,000
Total	821		306,057

* Paid by licensees, amount estimated by Department of Lands, Forests and Mines.

QUEBEC

Organized fire prevention is confined for the most part to the licensed Crown lands, comprising about 45,000,000 acres. Of this about 15,000,000 acres are patrolled by the two co-operative associations formed by licensees. Other limit holders provide for the patrol of their own limits. The province employs a certain number of rangers and inspectors but does not report details in regard to the staff. The 1914 report of the Department of Lands and Forests states that 660 rangers were on duty. It is thought that this includes the rangers employed by limit holders. The appropriation for forest protection was \$32,000 for 1913-14, \$39,000 for 1914-15, and \$40,000 for 1915-16. This appropriation covered the cost of the Government rangers and inspectors and also part of the cost of patrol and fire-fighting by the licensees and co-operative associations. An additional appropriation of \$5,000 was made each year for the protection and administration of the Laurentides park.

One of the associations, which patrols about 8,000,000 acres, employed 84 rangers in 1916 and expended for patrol and general expenses about \$25,000, or approximately 0.3 cent per acre. This expenditure is borne mainly by the licensees who pay into the treasury of the association at the rate of one-quarter of a cent per acre, the remainder being paid by the Provincial Government and by railway companies whose lines are patrolled by the association. The cost of fire-fighting was \$13,004 in 1914, \$7,329 in 1915, and \$2,758 in 1916, being paid by the licensees and the Provincial Government.

NEW BRUNSWICK

The area of Crown lands is approximately 7,500,000 acres. The Provincial Government bears the cost of fighting fires, action being taken by commissioners of highways, county councillors or constables under authority of the Forest Fires Law. In 1914 the province paid out \$853 for fire-fighting, and in 1915, \$1,253.

NOVA SCOTIA

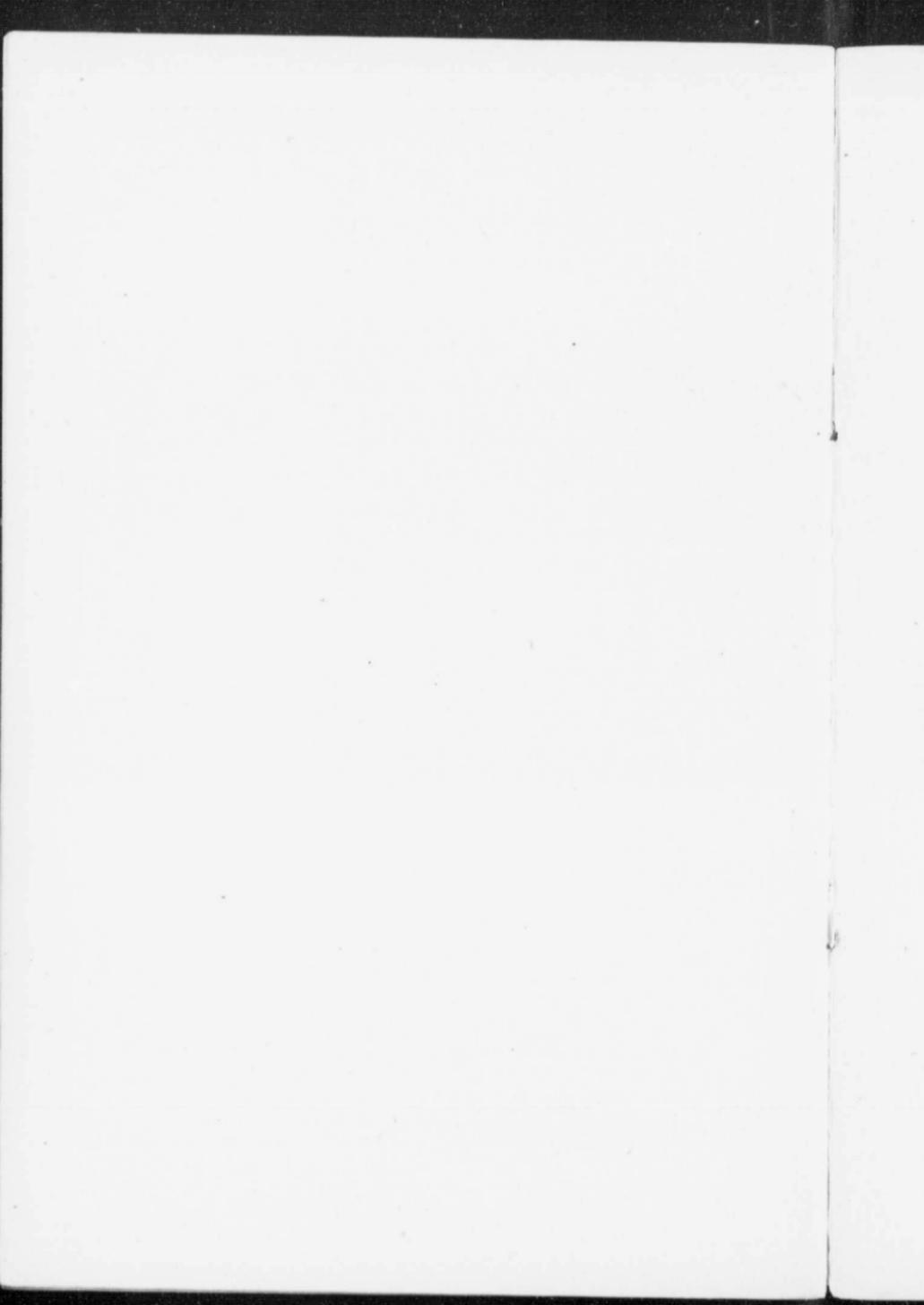
The area of the province, leaving out the cleared lands, is given by the Commission of Conservation as 9,800,000 acres.

The Nova Scotia fire law provides for the appointment in each county or municipality of chief fire rangers who are empowered to appoint any necessary number of sub-rangers. These men are paid for the time actually spent in patrol or fire-fighting according to the demands of the season, usually a few days each month. A tax of one-quarter of a cent per acre is levied on timberlands to cover the cost of patrol and fire-fighting, and any deficiency is made up by the municipalities.

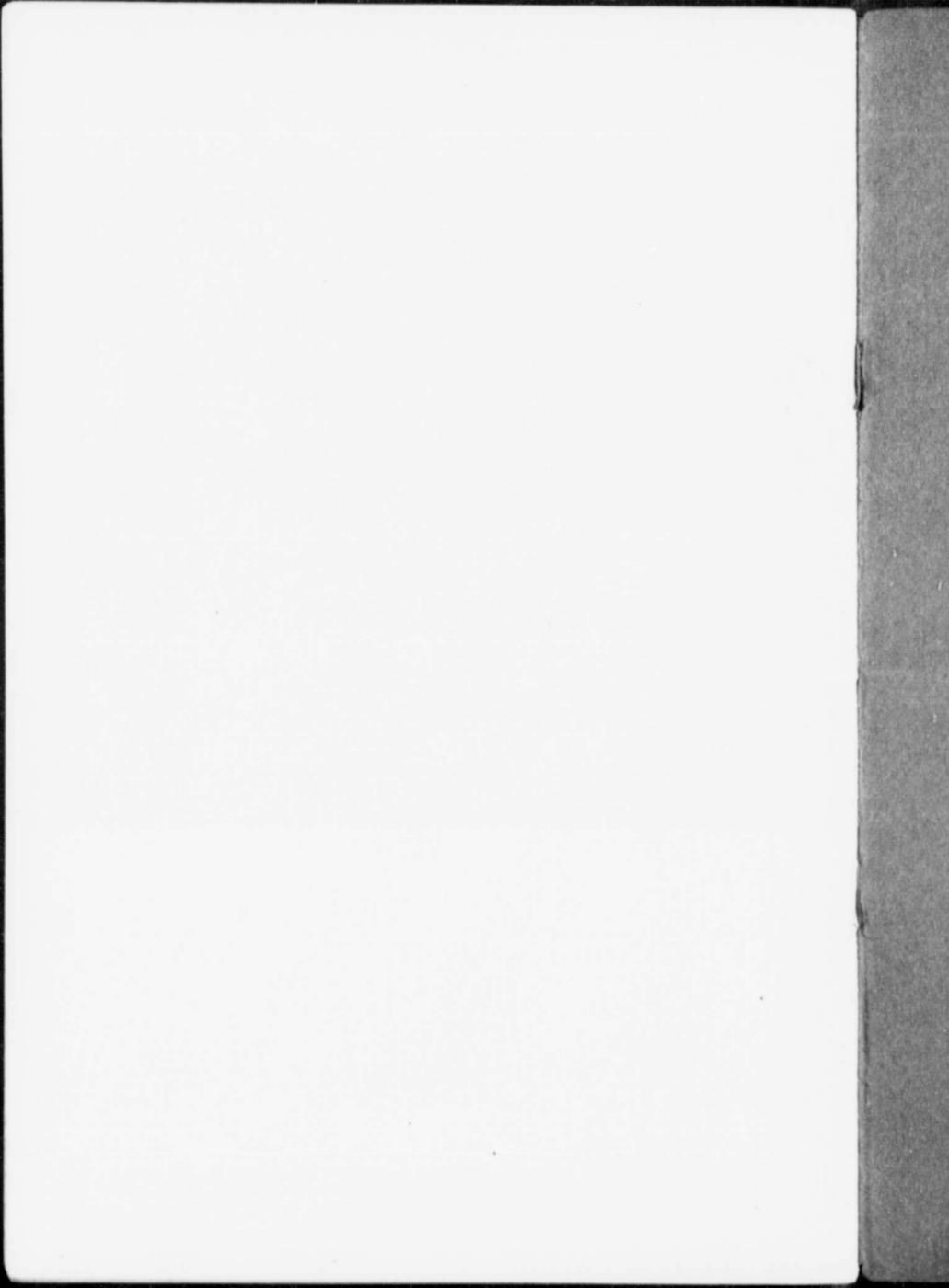
Reports are made by fifteen chief rangers covering all of the mainland except one county, but none is made of Cape Breton island. The average area under each chief ranger is about 462,000 acres. The area covered by these rangers is about 79 per cent of the area of the province. The expenditures under their supervision amounted to \$5,719 in 1914, \$3,850 in 1915, and \$1,389 in 1916, being an average of 0.06 cent per acre, including the cost of fighting fires.

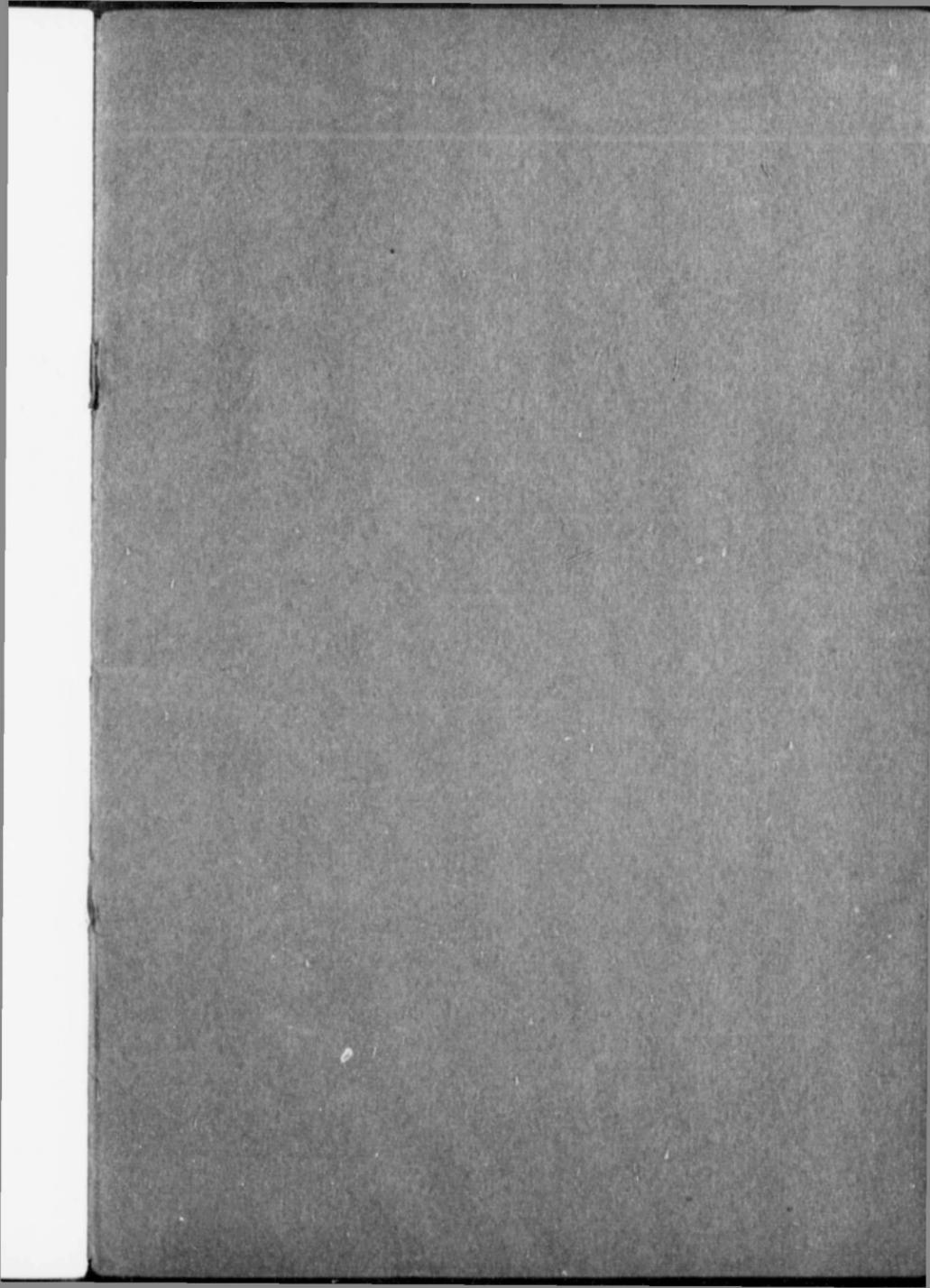
DOMINION CHARTERED RAILWAYS

The maximum patrol required in 1916 by the Board of Railway Commissioners for Canada in the height of the fire season is outlined hereunder. When conditions were not dangerous relief from some of the patrols was granted. The actual patrols were, therefore, somewhat less than the figures given. The figures apply to all Dominion chartered lines in the whole of Canada, passing through forest sections. Special patrolmen were called for to cover 4,171 miles as follows: 64 on power speeders, 112 on velocipedes (23 of whom were also bridge watchmen), 2 on horseback, and 20 on foot. In addition to the above, patrol work was performed by the regular track forces on 3,385 miles, making a total of 7,556 miles of lines in forest sections covered by special and section patrols. The average length of patrol beats was 33 miles for power-speeder patrols and 18 miles per man on velocipede.











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- Bulletin** 1. Tree Planting on the Prairies.
- " 8. Forest Products of Canada, 1908.
- " 11. Forest Products of Canada, 1909: Lumber, Square Timber, Lath and Shingles.
- " 12. Forest Products of Canada, 1909: Pulpwood.
- " 14. Forest Products of Canada, 1909: Cross-ties Purchased.
- " 15. Forest Products of Canada, 1909.
(Being Bulletins 11, 12, 13, 14, 19 and 20.) French edition only.
- " 16. Forest Fires and Railways.
- " 22. Forest Products of Canada, 1910: Cross-ties.
- " 23. Forest Products of Canada, 1910: Timber Used in Mining Operations.
- " 24. Wood-using Industries of Canada, 1910: Agricultural Implements and Vehicles, Furniture and Cars and Veneer.
- " 27. Forest Products of Canada, 1910: Coeperage.
- " 32. The Turtle Mountain Forest Reserve.
- " 33. Forest Conditions in the Rocky Mountains Forest Reserve.
- " 34. Forest Products of Canada, 1911: Lumber, Square Timber, Lath and Shingles.
- " 35. Forest Products of Canada, 1911: Poles and Cross-ties.
- " 36. Wood-using Industries of Ontario.
- " 37. Forest Products of Canada, 1911.
(Being Bulletins 30, 31, 34 and 35.)
- " 38. Forest Products of Canada, 1912: Pulpwood.
- " 39. Forest Products of Canada, 1912: Poles and Ties.
- " 42. Co-operative Forest Fire Protection.
- " 44. Wood-using Industries of the Maritime Provinces.
- " 46. Forest Products of Canada, 1913: Pulpwood Consumption.
- " 47. Forest Products of Canada, 1913: Poles and Cross-ties.
- " 48. Forest Products of Canada, 1913: Lumber, Lath and Shingles.
- " 49. Treated Wood-block Paving.
- " 51. Game Preservation in the Rocky Mountains Forest Reserve.
- " 52. Forest Products of Canada, 1913. (Being Bulletins 46, 47 and 48.)
- " 53. Timber Conditions in the Smoky River Valley and Grande-Prairie Country.
- " 54. Forest Products of Canada, 1914: Pulpwood.
- " 56. Forest Products of Canada, 1914: Lumber, Lath and Shingles.
- " 57. Forest Products of Canada, 1914: (Being Bulletins 54, 55 and 56.)
- " 58. Forest Products of Canada, 1915: (Being Bulletins 58a, 58b, and 58c).
- " 58a. Forest Products of Canada, 1915: Lumber, Lath and Shingles.
- " 58b. Forest Products of Canada, 1915: Pulpwood.
- " 58c. Forest Products of Canada, 1915: Poles and Cross-ties.
- " 59. Canadian Woods for Structural Timbers.
- " 60. Canadian Douglas Fir: Its Mechanical and Physical Properties.
- " 62a. Forest Products of Canada, 1916: Lumber, Lath and Shingles.
- " 62b. Forest Products of Canada: Pulpwood.
- " 62c. Forest Products of Canada: Poles and Cross-ties.
- " 62d. Forest Products of Canada: Directory of Saw-mills in Canada.
- " 63. Wood-using Industries of Quebec.
- Circular** 5. Planning a Tree Plantation for a Prairie Homestead.
- " 6. Preservative Treatment of Fence-posts.
- " 7. Manitoba a Forest Province.
- " 8. The Forest Products Laboratories.
- " 9. Chemical Methods for Utilizing Wood Wastes.