

DEPARTMENT OF THE INTERIOR, CANADA

HON. CHARLES STEWART, MINISTER

W. W. CORY, C.M.G., Deputy Minister

E. H. FINLAYSON, Director of Forestry

REPORT

OF THE

DIRECTOR OF FORESTRY

FOR THE FISCAL YEAR ENDED MARCH 31

1926

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1927

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FORESTRY

REPORT OF THE DIRECTOR OF FORESTRY, E. H. FINLAYSON

This report covers the operations of the Forest Service for the fiscal year ended March 31, 1926.

FOREST FIRES

The situation as to fires during the 1925 season was, on the whole, satisfactory. Manitoba and Saskatchewan experienced a normal season, and conditions in Alberta were good, especially in the southern half of the province. In British Columbia, however, a rather serious situation obtained. Spring in that province set in early, the snow soon disappeared, and the weather continued dry throughout April and May. Again from the middle of June to the middle of August the weather was very hot and rainfall scanty or altogether lacking; many dry electrical storms, with high winds, occurred. In the interior the weather improved about the middle of August, but on the coast the hazard continued until the end of September.

The total number of forest fires on Dominion lands was 1,165, of which 473 (40 per cent of the total) were large fires. The total area burned over was 524,225 acres, of which the merchantable timber area was 126,970 acres, and the area covered with young growth, 157,135 acres. (See also page 12.)

AIR PATROL

Patrol of the forested districts by aircraft was continued in parts of Alberta and Manitoba. In the former province two patrols were maintained, with the High River station as a basis, covering the Rocky Mountains reserve from the International Boundary northward, including the Crowsnest, Bow River, and part of the Clearwater forests. In Manitoba air patrol was provided in the territory east of lake Winnipeg and in the northern part of the province.

IMPROVEMENTS

A large amount of improvement work was carried out in all the districts except British Columbia; in the latter province the fire situation demanded almost exclusive attention. A noticeable feature in connection with the improvement work is that of late years it tends to be put chiefly on maintenance of existing improvements. The following statement shows the improvements made during the year:—

	Number		Miles
Ranger station house.....	1	Telephone lines	275
Cabins	13	Roads	234
Stables (8) and barns (2)....	10	Trails	412
Other buildings	8	Fireguards (cleared).....	524
Seed-extraction plant	1	Fireguards (ploughed)....	212
Bridges	4		
Lookout towers	11		

GRAZING

Grazing use in the forest reserves was about the same as for some years past. The live stock industry has been at a low ebb, and this has been reflected in a somewhat lessened use of the reserves. Alberta reports a slight increase in the number of grazing permits—the first since 1920—but in other provinces the number of such permits remained about the same. In British Columbia there was a greater interest shown in the grazing facilities of the forest-reserve range, and a number of ranchers were thus enabled to combat successfully a very dry season.

The classes and numbers of stock pastured on the forest reserves were:—

Cattle	40,722
Horses	10,822
Sheep and hogs	4,923

MANITOBA PULP SALE

The outstanding item in reference to the disposal of timber with which this service had to deal was the granting of a pulpwood concession in Manitoba to the Manitoba Paper Company. While the timber is to be selected from areas on Dominion lands outside the forest reserves, the administrative responsibility for the sale has been delegated to the Forest Service.

TIMBER SALES AND PERMITS

The number of timber sales operating on the forest reserves shows an increase of eight over the previous year. Two sales were put through in Saskatchewan, and nine in Alberta, although a very mild winter in the latter province hindered cutting operations. In British Columbia timber sales were spread over a much wider territory than previously. It is gratifying to note from the reports of the field officers that the regulations of the Service with respect to brush disposal, cutting procedure, etc., are, as a rule, being faithfully carried out.

REVENUE

The total revenue of the Forest Service for the year shows a slight increase over that for the fiscal year 1924-5, which was the highest recorded up to that time. This increase was due to wider use of forest-reserve timber under timber sale or permit. The revenue from the timber sales showed an increase of 10 per cent, and the increased number of timber permits issued provided additional revenue from this source of almost 30 per cent.

The grazing business, on the other hand, shows a slight falling off. The number of permits issued was greater than the previous year, but the total number of stock pastured on forest reserves under the permits showed diminution.

PLANTING AND SEEDING ON FOREST RESERVES

Experimental planting and seeding was further extended. During the year approximately 54 acres were planted on the various reserves. Nearly 135,000 trees, including 80,893 Scotch pine, 17,940 white spruce, 14,639 Douglas fir, 13,729 jack pine, and 6,573 lodgepole pine, were used for this purpose. In addition about 220 acres were sown with 213 pounds of tree seed, including jack pine, lodgepole pine, red pine, Scotch pine, white spruce, and yellow birch.

SEED COLLECTION AND EXTRACTION

The Forest Service has now four seed-extracting plants in operation, namely those at Indian Head, Saskatchewan, Vancouver, British Columbia, Rocky Mountain House, Alberta, and Prince Albert, Saskatchewan. The combined output of these plants during the season of 1925-6 made up a total of about one and a quarter tons of the seed of the various coniferous trees species. Several hundred pounds of the seed of broadleaved species were also collected. A quantity of unextracted cones also remained on hand.

TREE PLANTING ON PRAIRIE FARMS

The season of 1925 was favourable for tree-planting operations. There was no damage reported from winter-killing, but limited damage occurred from rabbits and insects—especially cutworms, tent-caterpillars (chiefly on poplar), and aphids. Most of the existing plantations continue to receive care, only six and a half per cent being reported as failures, while seventy three per cent are quite successful; the remaining twenty per cent offer prospects of success provided past neglect be atoned for by special attention for a time.



PLATE 1.—A WELL PROTECTED PRAIRIE FARMSTEAD

The shelter-belts around this Saskatchewan prairie home are about fifteen years old. The trees were furnished by the Dominion Forest Service.

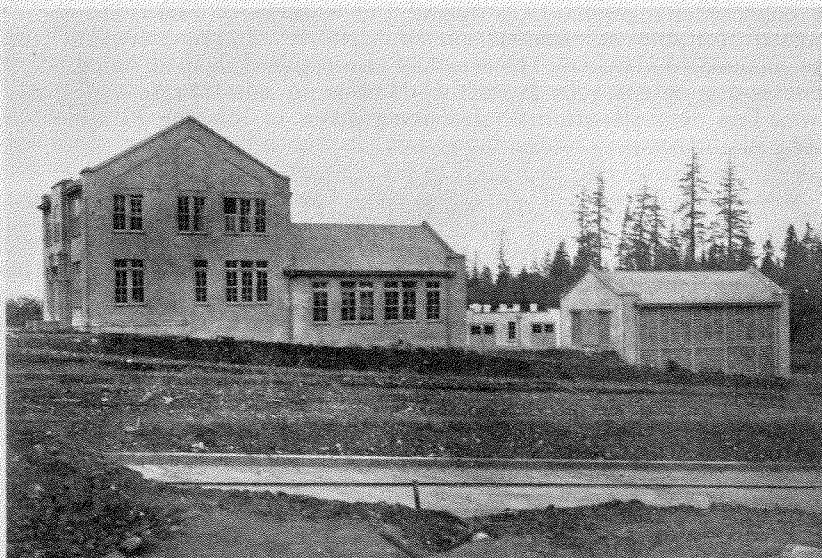


PLATE 2.—NEW BUILDING OF THE VANCOUVER (B.C.) FOREST PRODUCTS LABORATORY

This building was erected for the Forest Products Laboratory by the University of British Columbia. It is located at Point Grey, where the University has its site. The Forest Service and the University co-operate in maintaining the Laboratory.

Unfortunately, the Indian Head nursery suffered from drought during the summer; no serious diminution in the number of the stock on hand for distribution is anticipated, but some of the material will be smaller than usual. The drought also provided favourable conditions for development of insect pests. The number of broad-leaved trees distributed was about the usual number, i.e., approximately five million. Conifers sent out showed an increase from 73,290 in 1924 to 90,000 in 1925. An interesting feature of the work at the Indian Head nursery station was the thinning of the permanent plantations. From six plots planted in 1905 and 1906 and aggregating slightly over four and a half acres, the thinnings amounted to seventeen and three-quarter cords of fuel-wood. The stands left are, of course, in better condition than ever.

SURVEYS

As a result of working-plan surveys, advances were made in placing several of the reserves under working plans. The survey of the Sandilands forest reserve, in Manitoba, was completed during the summer of 1925, and type and improvement maps compiled from the data secured. In Saskatchewan a survey of forty square miles of the Nisbet forest reserve was completed, and a type map prepared which will serve as the basis of a working plan for the reserve. In Alberta 360 square miles of the Brazeau forest and 40 square miles of the Clearwater forest were similarly mapped, as a preliminary step to the formulation of working plans.

RECREATIONAL USE OF FOREST RESERVES

One of the most striking features in the development of the use of forest reserves as recreational areas has been the eager manner in which the public have grasped the possibilities for holidaying and recreation which are afforded therein. This is true not only of people living in the neighbourhood, but of visitors from outside points. On one of the reserves in Manitoba an inn has been erected for the accommodation of visitors. Improvement of camping facilities in the Saskatchewan reserves has also resulted in their being patronized to an increasing extent. In British Columbia an addition to the Paul Lake resort was laid out; attention is also being given to locating suitable camping sites along motor roads.

FOREST PRODUCTS LABORATORIES

The co-operative arrangement between the Forest Service and the pulp and paper industry, as represented by the Canadian Pulp and Paper Association, came into effect at the beginning of the fiscal year, and considerable expansion in the work of the Pulp and Paper Division has thus been brought about. A standard instrument and procedure for the "freeness" test of pulp were designed, and a number of the instruments were distributed to pulp manufacturers. Enlarged accommodation and increased equipment for the study of pulp and paper problems were acquired. Work in kiln-drying received increased attention, especially in the direction of work in co-operation with manufacturers and lumber dealers operating kilns. Study of red rot and red stain in jack pine was continued, and at least one of the causal organisms of the decay was determined. The work of determining the spike-holding power of jack pine ties so infected was concluded, and the results communicated to the railways. Further study of this form of decay was carried on with the object of determining the life of ties so affected, several hundred ties being placed in position on railway lines, to be kept under observation for an extended time. Tests of a new method of injecting a wood preservative, zinc chloride, into wood were made with favourable results.

The Forest Products Laboratory at Vancouver, British Columbia, was moved to new buildings erected by the University of British Columbia at Point Grey. Some 9,000 additional strength tests on British Columbia and Alberta woods were made, and a series of comparative strength tests was conducted on two

shipments of lodgepole pine ties from Alberta and British Columbia respectively. Comparative tests of green-cut and fire-killed cedar poles were made in order to ascertain if any loss in strength had been incurred as the result of fire-killing. Many tests were conducted also for wood-working industries. Considerable attention was given to kiln-drying, and a representative of the laboratory gave a series of six lectures on "the seasoning of wood" to lumbermen from Vancouver, Victoria, and the surrounding districts. An experimental dry-kiln is being installed, and a pathological laboratory equipped. Accommodation is also being provided at the laboratory for a representative of the Entomological Branch of the Department of Agriculture who is engaged in studying insect infestations.

FOREST RESEARCH WORK

At the Petawawa (Ontario) forest experiment station a working-plan survey was made of a section of the reserve with the object of conducting operations on a sustained-yield basis. The Royal Canadian Air Force and the Topographical Surveys, Department of the Interior, lent material assistance in providing an aerial photographic map of the section, which was used as a basis for the survey.

A timber sale of mature jack pine was commenced on a section of the surveyed area, under the direct supervision of a technical officer. Permanent sample plots were also established on this area for the purpose of studying the effect of the cutting on the remaining stand and on reproduction. A comprehensive investigation was conducted on methods of estimating timber, and a report with important findings has been prepared. An experimental nursery for propagation of exotics has been established, by means of which it is proposed to build up an arboretum at this station.

Extensive yield studies of jack pine and taper studies of red pine were made in northern Ontario.

At the Lake Edward (Quebec) experiment station a regeneration survey covering some ten square miles was made by line-plot system, and preliminary growth data for cut-over pulpwood lands were obtained. Extensive studies in the pulpwood operations of several industrial concerns were conducted to investigate the solid-wood content per stacked cord of pulpwood, and to prepare a volume table based on cord unit instead of cubic-foot or board-foot unit.

In New Brunswick the investigation of the effect of various cutting methods upon reproduction, rate of growth, and mortality in slow-growing black spruce types was extended to areas at Cains river. Cutting was done under the direction of the Research division, and a complete series of permanent sample plots was established on the cut-over area. Private companies co-operated with this service in several investigations. The extensive experiments in reseeded burned areas in New Brunswick, conducted in co-operation with the Honorary Advisory Council for Scientific and Industrial Research and the New Brunswick Forest Service, were completed during the year. Some tentative and apparently favourable results have been obtained from the earlier work.

Forest research on the western forest reserves has increased in scope. Experiments with methods of seeding and planting were reorganized. Several experimental cutting areas were established in connection with timber sales, and the work in connection with the three working-plan surveys was continued. In all of these activities the Research Division acts in an advisory capacity.

The form-class volume tables for many species prepared by this division are in great demand and are becoming standard.

PUBLICATIONS

The most important publication of the year was Bulletin No. 77, "Statistical Methods in Forest-investigative Work," which deals with the application of statistical methods, now so widely used in the scientific and commercial worlds, to the problems of research in forestry. Circular No. 18, "The Kiln-

drying of British Columbia Softwoods," was also published this year; it treats in a non-technical way of a problem of much importance to the timber interests of that province; the demand for this has necessitated a new edition within the year. Circular No. 19, "Canadian Softwoods," was prepared mainly for the Wembley exposition, and gives a short account of the properties and uses of Canadian softwood timbers. Two new Tree Pamphlets, Nos. 9, "Balsam Fir," and 10, "(Eastern) Cedar" were brought out. Bulletin No. 1, "Tree Planting on the Prairies," was again reprinted; the total number of copies of this publication printed up to date is ninety thousand. The pamphlet "Talking Trees" was also reprinted.

PUBLICITY

Efforts in the direction of publicity, particularly with respect to forest-fire prevention, were renewed in the spring of 1925 by a repetition of Save-the-Forest Week, which was fixed, by proclamation, as the fourth week of April, from the 19th to the 25th of that month. A new and successful feature of the celebration this year was the formation of a National Advisory Committee, representative of the press, wood-using industries, service clubs, and many other national organizations interested in forest conservation. Through the good offices of the several provincial forest services, provincial committees were appointed for direct supervision of the campaign in the respective provinces.

The program, as in the previous year, included addresses before schools, service clubs, Boy Scouts, Girl Guides, and other organizations. A total of 213,250 pieces of publicity material was distributed, comprising blotters, booklets, school programs, charts, etc. The radio was also brought into service, speeches being broadcast by the Prime Minister, Right Hon. W. L. M. King, and the provincial premiers or their representatives. Large advertisements were placed in many of the leading newspapers of the Dominion, calling attention to the destruction of the forests by fire and the need of care in dealing with the country's forest resources.

This campaign naturally took much of the attention of the publicity division for a considerable period of the year. In addition this division prepared a great deal of publicity material for use by the field officers of the Service. A very important part of the work of the division consisted of a series of visits to summer-vacation camps for boys and girls. A member of the staff and two temporary assistants were employed in this work during the summer season. Their work consisted in supervising "hikes" for the campers through the adjoining woods, instructing them in tree-identification, and in promoting the idea of forest-fire prevention by talks around the camp-fires at night. Twenty-one camps were visited in this way, and some 1,400 "teen-aged" boys and girls were reached.

FOREST SERVICE REVENUE FOR THE FISCAL YEAR 1925-6

The statement of revenue follows on page 11. Under "Timber Permits", the kinds, and total quantities of timber authorized to be cut from all reserves were as follows:—

Fuel-wood (cords).....	32,236
Fence-posts, rails and piling (number).....	373,742
Fence-posts, rails and piling (linear ft.).....	36,922
Telephone poles (linear ft.).....	7,679
Railway ties (number).....	12,694
Saw-timber (ft. B.M.).....	8,424,338
Mining timber (linear ft.).....	2,170,962
Mining timber (cords).....	80
Mining timber (ties).....	9,606
Building logs (number).....	30,083
Building logs (linear ft.).....	368,116
Miscellaneous (linear ft.).....	968
Miscellaneous (cords).....	2,503
Miscellaneous (number).....	267

STATEMENT OF REVENUE, FOREST SERVICE, FISCAL YEAR ENDED MARCH 31, 1926

Reserve	Number of timber sales	Revenue from timber sales	Number of timber permits	Revenue from timber permits	Number of grazing permits	Revenue from grazing permits	Other Sources of Revenue				Miscellaneous	Total revenue all sources
							Hay permits and seizures	Surface rentals	Special uses	Tree seed		
		\$ cts.		\$ cts.		\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
Duck Mountain—Manitoba.....	1	491 35	470	3,999 79	74	391 80	196 00	545 25	120 00		3 00	5,747 19
Porcupine No. 1—Manitoba.....			129	2,159 68			19 25		185 00			2,363 93
Riding Mountain—Manitoba.....	2	6,393 10	1,599	16,003 73	28	388 80	583 25	1,291 35	391 00		3 00	25,054 23
Sandilands—Manitoba.....			28	218 11			5 25					223 36
Spruce Woods—Manitoba.....			17	44 75			60 75					105 50
Turtle Mountain—Manitoba.....			42	211 00	48	533 00	138 75	48 15	90 00		25 00	1,045 90
Beaver Hills—Saskatchewan.....			89	225 70	5	57 08	161 25		1 00			445 03
Big River—Saskatchewan.....	5	263 00	48	405 32	4	157 96	409 25		33 50			1,269 03
Dundurn—Saskatchewan.....			68	217 50	15	336 13	48 25		12 00			613 88
Elbow—Saskatchewan.....			33	75 50	181	1,229 70	14 50	10 00	338 20		25 00	1,692 90
Fort à la Corne—Saskatchewan....	3	2,034 85	430	3,307 92			16 00	78 00	29 00		25 00	5,490 77
Keppel—Saskatchewan.....			54	152 25	94	705 70	8 75		16 00			882 70
Manito—Saskatchewan.....			92	353 50	111	2,037 81	34 50		27 00			2,452 81
Moose Mountain—Saskatchewan.....			171	927 60	63	574 50	185 00	159 05	176 00		73 00	2,095 15
Nisbet-Pines—Saskatchewan.....	5	623 40	364	2,722 04	36	389 58	140 75	48 75	365 25			4,289 77
Pasquia—Saskatchewan.....	27	75,786 32	161	5,888 28	10	114 36	318 00	3 00	90 00		54 83	82,254 79
Porcupine No. 2—Saskatchewan.....	6	2,504 35	215	2,078 58	7	130 04	309 50	54 00	131 00		10 00	5,217 47
Seward—Saskatchewan.....	2				29	763 26	65 25		25 00			853 51
Sturgeon—Saskatchewan.....		651 96	46	285 69	10	94 60	72 25	10 00	41 00			1,155 50
Athabaska—Alberta.....			1	8 50	8	88 78			52 00		5 50	154 78
Bow River—Alberta.....			66	314 53	111	4,577 12	11 00		35 00		1 00	4,938 65
Brazeau—Alberta.....	8	3,870 30	37	2,993 13	71	227 38		783 11	183 00		12 75	8,069 67
Clearwater—Alberta.....	3	5,443 36	38	750 63	56	397 92	20 50	607 33	245 91		10 00	7,475 65
Cooking Lake—Alberta.....			2	9 00	55	562 18	102 00		5 00			678 18
Crowsnest—Alberta.....	4	923 03	192	2,538 24	197	7,903 84	2 25	39 23	567 25		101 95	12,075 79
Cypress Hills—Alberta.....			592	2,225 31	187	3,887 33		51 33	73 54			6,237 51
Lesser Slave—Alberta.....	5	20,311 46					10 75		12 00		2 00	20,336 21
British Columbia Reserves.....	22	5,912 87	25	321 93	18	389 60	59 50	235 65	242 69	5,206 15	43 43	12,411 82
Indian Head Nursery—Sask.....											2,096 52	2,096 52
Forest Products Laboratories.....											524 00	524 00
Petawawa Exptl. Station.....	1	2,378 18										2,378 18
Sundries.....											78 00	78 00
Totals.....	94	127,587 53	5,009	48,438 21	1,418	25,938 47	2,992 50	3,964 20	3,487 34	5,206 15	3,093 98	220,708 38

FIRES WITHIN FOREST RESERVES

Cause	1925		1924		1923	
	Number	Per cent of total	Number	Per cent of total	Number	Per cent of total
Camp-fires.....	36	20	44	20	21	12
Smokers.....	13	7				
Settlers.....	44	24	95	42	43	24
Railways.....	32	18	8	4	30	17
Lightning.....	9	5	5	2	4	2
Lumbering.....	0	0	4	2	2	1
Incendiary.....	23	13	32	14	8	4.5
Public works.....	4	2	3	1	1	0.5
Unclassified.....	8	4	7	3	7	4
Unknown.....	13	7	28	12	61	35
Totals.....	182	100	226	100	177	100

FIRES OUTSIDE FOREST RESERVES

Camp-fires.....	161	16	278	22	193	18
Smokers.....	84	9				
Settlers.....	148	15	322	26	298	28
Railways.....	239	24	300	24	203	19
Lightning.....	139	14	77	6	73	7
Lumbering.....	21	2	22	2	15	1
Incendiary.....	45	5	60	5	26	2
Public works.....	0	0	4		12	1
Unclassified.....	27	3	30	2	25	2
Unknown.....	119	12	168	13	236	22
Totals.....	983	100	1,261	100	1,081	100

TOTAL FIRES ON DOMINION LANDS PROTECTED BY FOREST SERVICE

Cause	1925		1924		1923	
	Number	Per cent of total	Number	Per cent of total	Number	Per cent of total
Camp-fires.....	197	17	322	22	214	17
Smokers.....	96	8				
Settlers.....	192	16.5	417	28	341	27
Railways.....	272	23.2	308	21	233	18
Lightning.....	148	13	82	5.5	77	6
Lumbering.....	21	2	26	2	17	1
Incendiary.....	68	6	92	6	34	3
Public works.....	4	0.3	7	0.5	13	1
Unclassified.....	35	3	37	2	32	3
Unknown.....	132	11	196	13	297	24
Totals.....	1,165	100	1,487	100	1,258	100

THE TREE-PLANTING DIVISION

Norman M. Ross, Chief

With the exception of a few comparatively small localized areas the season of 1925 was a very favourable one for tree-planting work and agricultural operations over the Prairie Provinces generally. The spring opened about two weeks earlier than last year, and precipitation and growing conditions generally induced a good growth in the older plantings and gave the newly planted belts a good start. Generally speaking, no damage was done from winter-killing, but certain districts reported much damage again from rabbits and a few from insect infestations, principally the red-backed cutworm and forest tent-caterpillar. The cutworm appeared very generally over large areas in central and southern Saskatchewan and materially affected farm crops, particularly barley, oats, and sweet clover. In the newly set out plantations in the infested areas they destroyed a number of the poplar and willow cuttings just as they were rooting and also defoliated the freshly planted caragana seedlings. The latter mostly recovered later in the season. The tent-caterpillar was confined principally to the native poplar, and while found on some of the cultivated willows and ash did not actually cause the death of any of these trees. An insect which is doing more harm than is generally realized is a small dark-coloured aphid which seems to be increasing in numbers of late years and attacks willows and poplars in the plantations. Willows appear to suffer most, and many belts, particularly on higher soils, have been very badly set back and in some cases killed as a result. The insects are not conspicuous but crowd very numerously on the young growth and suck out the sap. When noticed in time they can be readily controlled by spraying with "Nicotine Sulphate" or "Black Leaf 40." Unfortunately their presence is not usually noticed until after the trees have been considerably weakened.

Some 5,700 reports made after inspection of the older plantations this season indicate only $6\frac{1}{2}$ per cent failures with $73\frac{1}{2}$ per cent in thriving condition and the remaining 20 per cent in fair shape and capable of being brought into good condition with a little more care and attention. Of the newly set out stock, reports show that of the seedlings 93 per cent were growing and of the cuttings 90 per cent took root.

Nursery Work.—The nursery at Indian Head was this season in a very localized area which suffered from lack of precipitation, receiving probably not more than five inches of rain during the growing period. This dry condition greatly increased injury from cutworms, which did much damage in the newly sown plots of ash and caragana, reducing the stand almost 50 per cent. An estimated loss of 25 per cent in the newly set out evergreen transplants was due to drought. The evergreen seed-beds, for which watering facilities are available, produced excellent stands. In spite of the drought the broad-leaved stock developed fairly satisfactorily, although reduced in numbers. The growth of the pine transplants was much retarded—so much so, in fact, that the four-year-old plants, which should have been ready to send out this spring (1926), must be carried over for another season's growth. The cutworms proved very injurious to the seedlings of ash and caragana in the freshly sown plots both at the Indian Head and Sutherland nurseries. Although measures to control the insects by using poisoned bait were employed as soon as their presence was realized, the loss from this source was very considerable. A new pest, a small snout beetle about $\frac{3}{16}$ of an inch long, was discovered in the caragana plots. Owing to its minute size and neutral colour it was very difficult to find, but the damage was very severe. One plot of two acres was completely destroyed before it could be determined what was causing the damage. The remaining plots were then promptly sprayed and the damage controlled. These small beetles work from

the time the seedlings germinate until they are up to one inch high. They do no serious injury to older plants. In the older plantations at Indian Head considerable spraying had to be done to control the forest tent-caterpillar, the larch saw-fly, the willow and poplar aphid, and the small white-pine scale which is apparently likely to be a serious pest, if not controlled, particularly on white spruce.

Distribution of Stock.—Shipping commenced on April 14 at Indian Head and April 17 at Sutherland, at least ten days earlier than in 1924. Approximately 5,000,000 seedlings and cuttings were sent out to 5,585 applicants. The stock consisted of two-year-old seedling ash, one-year-old maple, one-year-old caragana, and unrooted cuttings of Russian poplar and Russian willows. Of the evergreens, 90,400 transplants of Scotch pine, jack pine, lodgepole pine, and white spruce were distributed amongst 510 applicants; 2,700 were shipped to the Sutherland nursery for permanent planting, and 120,615 seedlings and transplants were sent to various forest reserves. There was thus a total evergreen distribution of 213,715. Material shipped to the reserves was as follows: To Spruce Woods reserve, 70,615; Dundurn reserve, 20,000; Elbow reserve, 10,000; Pines reserve, 10,000; Nisbet reserve, 10,000.



PLATE 3.—ONE OF THE EXPERIMENTAL PLANTATIONS AT THE INDIAN HEAD, SASKATCHEWAN, FOREST NURSERY STATION, AFTER THINNING AND PRUNING

The plantation is composed of Scotch pine and white spruce. It was planted in 1906; the photograph from which the illustration was made was taken in 1926.

Seed Collection.—Owing to late spring frosts it was impossible to secure collections of either maple or ash seed in any of the western provinces. About 250 pounds of caragana seed were picked at Indian Head and 580 pounds at Sutherland. About four bags of birch seed were collected at Sutherland and about thirty bushels of white spruce cones at the Indian Head nursery station.

Visitors.—Each season sees a great increase in the number of visitors at both the Indian Head and the Sutherland nursery stations. Parties came from long distances to picnic in the various groves and showed a keen interest in the development of the nurseries and the work being carried on.

Permanent Plots: Development, Thinnings, etc.—The permanent plantation plots at Indian Head are making splendid development. Some of the older ones are now at a stage where thinning operations are becoming necessary and

regular cuttings in all the older plots will now be in order. Thinnings were made this winter as follows:—

Plantation No. 1—Tamarack planted in 1905; area, $\frac{1}{3}$ acre; yield, 1.76 cords.

Plantation No. 2—Scotch pine and spruce; planted 1906; area, $\frac{3}{4}$ acre; yield, $4\frac{1}{2}$ cords.

Plantation No. 3—Scotch pine, tamarack, and spruce; planted 1906; area, 1 acre; yield, 1 cord Scotch pine, 1.76 cords tamarack.

Plantation No. 4—Scotch pine; planted 1906; area, 1 acre; yield, $4\frac{1}{2}$ cords.

Plantation No. 6—Cottonwood; planted 1906; area, 1 acre; yield, 2 cords.

Plantation No. 13—Mixed Scotch pine and spruce; area, $\frac{1}{2}$ acre; yield, $2\frac{1}{4}$ cords.

All this wood is of good fuel size. The original spacing in these plots was all 4 feet by 3 feet 6 inches. After thinning the average spacing of the remaining trees is about $5\frac{1}{2}$ feet each way. An inspection of the permanent plantations indicates very decidedly that it is quite practical to produce good fuel-wood under prairie conditions in a very reasonable time.

A considerable amount of pruning of dead limbs in older plantations of tamarack, Siberian larch, and pine was done, greatly improving the general appearance of the plantations and leaving them more accessible for obtaining measurements. Material of post size is now available of such species as poplar, cottonwood, willow, maple, tamarack, Siberian larch, European larch, and Scotch pine. A number of posts have been cut from these species and are being prepared with a view to carrying on experiments in treating with wood preservatives.

Exhibits.—An exhibit was prepared and shown at the summer fairs at Saskatoon and Regina in conjunction with a forest-reserve exhibit prepared by the Prince Albert office. The whole exhibit occupied a space of approximately 60 feet in length, the tree-planting portion consisting of scale models showing planted and unplanted farmsteads, seeds, leaves, sections of wood, etc., of the ordinary cultivated species and photographs of plantations and improved farm homes. The exhibit as a whole had a very attractive appearance and undoubtedly created very considerable interest. Hundreds of farmers availed themselves of the opportunity to discuss their tree-planting problems.

DOMINION FORESTS IN MANITOBA

H. I. Stevenson, District Forest Inspector

The fiscal year 1925-26 was marked by one event of outstanding interest in reference to the forests of Manitoba, namely, the agreement entered into between the Government and the Manitoba Paper Company.

The new industry thus provided will prove of great economic benefit to the province, opening up as it does a wider market for its pulpwood. An increasing quantity of pulpwood has been cut in late years from settlers' lands, the bulk of which has been exported. The mill now being erected will doubtless absorb much of this, in addition to large quantities from Crown lands adjoining settlements, all of which will be manufactured locally. The Company will also be drawing supplies from territory previously unexploited for pulpwood, which has to date been producing little or no forest revenue.

Fire Protection.—Weather conditions were such during the past summer that fire hazards were, except during the month of May, either normal or sub-normal. During the month of May (particularly the last two weeks), a critical period occurred, occasioned by a combination of strong winds, high temperatures, and low relative humidity. Up to this time there had been no growth, so that the dead vegetation of the previous year was quite inflammable. There were 106 fires reported during this two-weeks period which was a little over 66 per

cent of the total reported for the season. There was a total of 160 fires reported which burned approximately 40,200 acres. Of this area there were 6,937 acres which carried merchantable timber and 6,119 acres of young growth; the remainder was chiefly old burn and grass land. The burned area of 40,200 acres represents approximately eighty-five one-thousandths of one per cent of the area under protection.

The causes of fire are reported as follows: Settlers, 34 per cent; camp-fires, 19 per cent; incendiary, 7.5 per cent; lightning, 7.5 per cent; smokers, 6 per cent; railways, 5 per cent; other causes, 1 per cent; unknown, 20 per cent.

Air Patrol.—Aircraft used in fire protection gave very satisfactory service. Nine machines were assigned to this work. These planes operated from three bases, namely, Victoria Beach, Norway House, and Cormorant Lake (near The Pas). They made 256 patrols, occupying 836 hours, and covered approximately 54,439 miles. In all this flying there were only two or three accidents, and these were of a minor nature.

Requests for fire patrols were made daily from the office of the district forest inspector to the Royal Canadian Air Force, and this latter organization carried out the patrol.

Wireless communication was maintained between Winnipeg, Victoria Beach, Norway House, and Cormorant Lake by the Royal Canadian Corps of Signals. Weather reports were transmitted daily from each of the air bases, and it was largely from these that decisions were made as to when and where patrols should be carried out. By means of this wireless communication it was also possible to keep in touch with the district fire rangers and to know what the fire situation was at all times, so that when additional assistance was required and was available it could be supplied.



PLATE 4.—TWENTY-YEAR-OLD SCOTCH PINE PLANTATION, SPRUCE WOODS
NATIONAL FOREST, MANITOBA

This plantation was made in 1906, near Carberry, Manitoba. The average height of the trees in the picture is about twenty-five feet.

Improvements.—A large amount of improvement work, mostly in the way of maintenance, was carried out throughout the year. Four cabins, three stables and one house were erected, the latter being at the headquarters for the Sandilands forest reserve. Two steel towers, each 70 feet in height, were erected for purposes of fire detection. On one of these a range finder with a nine-foot barrel was mounted; with this instrument the distance of a fire, as well as its direction from the tower, can be readily determined. Twenty-seven miles of new telephone lines were constructed. A large amount of work was necessary on roads. Approximately 40 miles were graded; in dry weather these are excellent for automobile traffic. Approximately 110 miles of line were cut, varying in width from 8 to 16 feet, for the purpose of defining the forest-reserve boundaries and of serving as fireguards.

Silviculture.—The working-plan survey of the Sandilands forest reserve commenced in 1924 was completed last summer. From the data secured, forest-type and improvement maps have been prepared which have already proved to be of great help in the administration of this unit. A cutting plan has been prepared with the view of placing this area on a sustained-yield basis. For the purpose of securing data on growth rates, about 150 permanent sample plots were established; these will be re-measured periodically and the information gained will be used to revise the cutting plan.

A program of research work was carried out on each of the forest reserves. Experimental plots were established for the purpose of determining the best means of propagating the commercial tree species artificially. Other experiments were instituted with the object of studying the deterring factors in the natural regeneration of these trees. There were also experiments dealing with thinnings and growth rates. This work was first commenced in the province in 1904. Since that date approximately 200 plots have been established, for which annual or periodic records have been kept. Tentative conclusions have been drawn from many of these, and some light has been thrown on the technique of forest-crop production.

Grazing.—Owing to improved conditions in the stock-raising industry herds which had been greatly depleted during the period of depression are now being built up. It is expected that during the next few years increased demands will be made for pasturage on the forest reserves. The cattle grazed on the reserves during the year were in excellent shape when taken off in the autumn.

Recreational Uses of Forest Reserves.—As Manitoba is becoming more widely known from the tourist point of view, greater use is being made of the forest reserves for recreational purposes. The population of the summer colonies is growing constantly, and better and more attractive cottages are being built. The more recently opened summer resort at Clear Lake has now a comfortable inn, and all resorts welcome the tourist to their camping grounds and picnic parks. The larger summer resorts such as Madge Lake and Clear Lake are no longer merely local centres of recreation, but are becoming summer headquarters for guests from all the provinces and many points in the United States.

Publicity.—Co-operation has been the keynote of forest publicity during the past year, both business and professional. Persistent publicity through the schools, lecture platforms, and the press assisted markedly in gaining the sympathy of the leading men of affairs in the province. In the "Save the Forest Week" campaign some 25,000 pieces of publicity material were distributed, and excellent co-operation was received from service clubs and lumbermen's associations. A lecture course in certain phases of forestry was given to the students of the Dauphin normal school.

DOMINION FORESTS IN SASKATCHEWAN *C. MacFayden, District Forest Inspector*

During the year no new reserves were created, and the boundaries of those already established remained unaltered except for the withdrawal of a few quarter-sections that on examination were thought to be of agricultural value. A number of other areas claimed to be fit for agriculture were examined, but could not be recommended for withdrawal; on the other hand, after a careful examination some rather large additions to existing reserves were recommended. Two applications have been received from persons owning farm lands within forest reserves to have their lands exchanged for available and more suitable Dominion lands elsewhere, a practice that has been followed in the past, providing the applicant's lands were on examination found to be of no agricultural value.

Fire Protection.—The summer of 1925 from a fire-protection point of view may be said to have been a normal one, or perhaps a little more hazardous than normal. Fires started to occur during the first part of April, but gave no particular trouble until the first of May, when the situation became more serious, and in the ensuing month there was reported a total of 85 fires, or 73 per cent of the total occurring during the whole season. Further periods of danger occurred in August and again in the late fall, but they were of short duration. There was a total of 116 fires reported, 74 being on forest reserves and 42 on lands outside forest reserves. When these are classified by causes, it is found that settlers' operations account for a total of 40 (34 per cent of the whole), and one half of these reached the proportions of class "C" fires (those over 10 acres in area.) Next in point of numbers came fires attributable to campers and travellers with a total of 32, but over one-half of these were confined to class "A" fires (less than one-quarter acre in extent). It is interesting to note that railways, which a few years ago held first place in such statements, were responsible for only 7 fires, and that the proportion of fires due to unknown causes is the smallest it has ever been. The average fire assumes large proportions before it is controlled, and 66 per cent of those reported were over 10 acres in area, although a further classification of these by damage done shows that only one-half of them did damage to the extent of \$100. The total area burned over by all fires was 113,086 acres, but 41,445 acres of this was open grass land, light poplar, or other lands where the damage done was little or nothing. The damage done to standing timber, young growth, and property aggregated \$96,564. Not a single fire was reported on the Moose Mountain, Seward, Beaver Hills, Elbow, Dundurn, and Manito reserves. This is no doubt attributable to the fact that the neighbouring farmers utilize the grazing resources of these reserves, and for that reason have a direct and personal interest in preventing fires.

Improvements.—The season, from the standpoint of both weather and labour conditions, was a favourable one for the carrying out of improvement work. During the year six one-roomed log cabins were built, and four log stables and one frame stable were erected. Maintenance in work or material was put on a total of 95 buildings of all classes. A total of 189 miles of telephone line was constructed or entirely rebuilt, but on 65 miles of this there was no cost for materials, the line being built in co-operation with one of the lumber companies.

A couple of miles of new roads and a total of 37 miles of new trails were constructed. The general use of motor cars is tending to change the standards to which many of the reserve roads are built and maintained, and, while many of them are yet in only an indifferent condition, a number are now in very good shape for car travel and permit of a more frequent use of cars in fire-suppression work.

Particular attention has been given during the last few years to a system of lookouts on a number of the northern reserves, and during the year two 80-foot steel towers with enclosed lookouts were purchased and one erected. In addition to the steel towers there were five wooden towers erected, varying in height from 20 feet to 45 feet. More attention is again being given to the making and maintenance of ploughed fireguards, and there is in the district now a total of 325 miles of guard, of which over two-thirds have been ploughed and much of it worked to such an extent that its maintenance in a good serviceable shape is now a small matter each year. During the year 101½ miles of guard were cleared, and of these 54½ received the first ploughing. Two hundred and twenty-five miles of old guards were again ploughed and are in excellent shape for the 1926 spring fire season. As a rule these guards have been cleared to a width of 20 to 30 feet, in some cases more, and a strip 12 feet wide ploughed



PLATES 5 AND 6.—LUMBERING ON A NATIONAL FOREST IN SASKATCHEWAN

The upper picture shows a pile of logs cut on the Pasquia national forest, near Chemong, Saskatchewan. The lower picture shows a train of log sleighs drawn by a tractor on the same national forests. The policy of the Forest Service is to allow the fullest possible use of the national forests, consistent with good management. During the fiscal year 1925-26, \$175,000 worth of wood was cut on the national forests under the jurisdiction of the Forest Service of the Dominion of Canada.

in the centre of the clearing. In addition to the work on the regular guards, 11 miles of old trails were cleared to a width of 30 feet to act as fire-breaks without any ploughed guard.

Timber Sales and Timber Permits.—The cutting of timber under authority of timber sales and timber permits remained about the same as in the past two years. Two large sales, totalling 8,500,000 feet board measure, and 13 smaller sales, totalling 4,842,000 feet board measure, were made, and 5,000 cords of fuel-wood were disposed of. There was an increase in the number of permits issued over last year, these totalling 1,695, inclusive both of those for which dues were collected and those given free of dues to recent settlers. The different restrictions and requirements were complied with by the various operators, and it was only in a few cases that any compulsion was found necessary.

Silviculture.—Following the working-plan survey made a year ago of some forty square miles of the Nisbet forest reserve the information already collected was compiled and arranged as the basis of a working plan for this block. A very complete map was prepared of the same area showing in great detail the timber and young-growth conditions that exist. A very good start was made this winter on the removal of all trees bearing dwarf mistletoe. In order to meet the seed requirements of the nurseries established on the various forest reserves and the Indian Head nursery, approximately one thousand bushels of jack pine and white spruce cones were gathered. At the Prince Albert seed-extraction plant, erected a year ago, 430 pounds of white spruce seed and 165½ pounds of jack pine were extracted. More attention is being paid to the possibilities of broadcast seeding on sites where natural seeding cannot be expected and several experiments were made along this line during the year. Small nurseries are now established on eleven forest reserves and in the majority of cases the results are most encouraging. At the close of the year there were in round figures 200,000 transplants ready for permanent planting in the spring of 1926. This is sufficient to plant 80 acres. On the whole the best results are being attained on the southern reserves where only a sparse covering of timber exists naturally, and it is on these areas that the bulk of the planting will be done for the present, particularly since their open nature allows of the work being carried out at a minimum cost.

A series of experiments was started last fall to determine whether fall or spring nursery seeding gives the better results, and also whether straw or burlap makes the better winter covering for seed-beds or whether there is any advantage in either over the uncovered beds. A number of one-acre plots were sown broadcast last fall as an experiment in securing a stand directly in this simple and economical way. In the hope that it would throw some light on the problem of securing white spruce reproduction a very detailed examination was made of a number of areas logged in different ways, under different regulations and at different times during the past ten years. All the data possible were gathered on the stand as it originally existed and the quantity and class of material removed. Following this, a very close study was made of the change that has taken place in the remaining stand, particularly the reproduction that has come in since. The examination produced a mass of data that has only recently been compiled and summarized and is not yet properly analyzed.

Grazing.—The number of permits issued for grazing on the reserves remained about that issued for the past five years. The falling off in the number of stock maintained on the reserves is due to a decrease in the industry rather than any fluctuation in the number taking advantage of the grazing regulations. The revenue from this source in the year under review was \$6,484.54—approximately one-third of that produced in the year 1920-21—and reflects the reduction that has taken place in the number of stock grazed. There are, however, indications of an improvement in the stock industry and every possibility that the number grazed will again start to increase. During the year there were 175 permits issued for the cutting of hay, the total quantity involved being approximately 6,000 tons.

Recreational Uses.—The forest reserves more than ever before were used by the public for purposes of recreation, and in recognition of this demand steps were taken on a number of them to provide camping and picnicking facilities, in the belief that a public interested in this way would better appreciate and better observe the call for fire prevention. At a very small cost camp facilities were provided at favourable points, and, if one may judge from the use they received, were really appreciated. By the erection of road and direction signs people are being directed to such places and in two or three cases it has been amazing the patronage they received.

DOMINION FORESTS IN ALBERTA AND BRITISH COLUMBIA

C. H. Morse, District Forest Inspector

ALBERTA

The Alberta Inspection District includes all the forest reserves in Alberta, a portion of the Cypress Hills forest reserve lying in southern Saskatchewan, and the Edmonton fire-ranging district (a large area taking in the whole northern portion of the province).

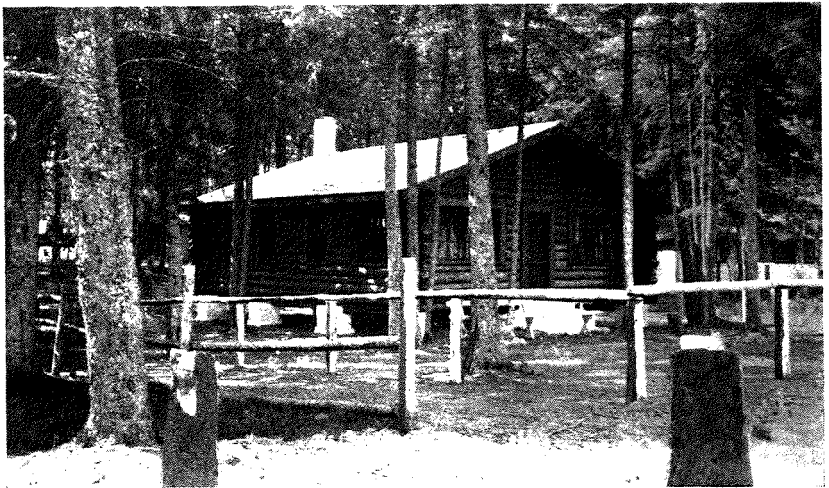
Forest Fires.—The fire situation was very satisfactory in Alberta during the past season. In the south heavy rain and snowfall occurred during the middle part of April and reduced the fire hazard for the time. The month of May opened up with hot, dry winds which soon brought about a serious situation. Rains occurring from the end of May until the middle of June made conditions safe again and brought on a wonderful growth of grass. From the latter part of June until the middle of August long periods of dry, hot weather occurred with little precipitation. Another period of fire danger occurred during the first week in September, but after that hazard was over there was no more fire danger during the autumn. The season was much the same in the north except that the precipitation up to the first of September was not so heavy as in the south and fires burned later in the season.

There were 261 fires reported during 1925 as compared with 641 in 1924, 669 in 1923, and 1,758 in 1922. Of this number 31 occurred within forest reserves and 230 in the fire-ranging district. Of those inside the reserves 22 burned over less than a quarter of an acre, 4 burned less than ten acres, and five were larger. Of the outside fires 118 were small, 50 were medium, and 62 were large.

Almost 28 per cent of the season's fires were the result of unextinguished camp-fires; railways were next with 26 per cent, but many of these were small. Settlers' fires accounted for 18 per cent of the total number of outbreaks; 6.5 per cent of them were incendiary; 3 per cent were caused by lightning. There were nine prosecutions for infractions of the Fire Act; of these seven were successful.

Air Patrols.—The forest-patrol work carried on by the Royal Canadian Air Force stationed at High River was continued during the 1925 season and proved very satisfactory. Two daily patrols were undertaken, one going north from a point inside the forest reserve west of High River and one going south. The regular patrol route follows along the foot-hill country just inside the forest-reserve boundary. From this route practically the whole reserve can be seen, especially the most hazardous districts of it. The northern patrol completed 247 flying hours and covered approximately 17,290 miles. The southern patrol also completed 247 flying hours and covered 17,285 miles.

Improvements.—During the year considerable progress was made in completing the improvement program for the forest reserves. Much of the work was done in the north country, the improvements in the south being mostly along the line of maintenance and the reconstruction of old projects. A total of 194 miles of new trail was constructed, 60 miles of old trail relocated and reconstructed, and eight miles of motor road built in the Crowsnest forest. On the Brazeau forest two miles of fireguard were ploughed along railway lines. Altogether 85 miles of new telephone lines were built, 70 miles of this being on the Clearwater forest which was previously without telephone communication. Thirty-four miles of old telephone line were reconstructed. In all, ten buildings were constructed during the year; these included a seed-extraction plant at Rocky Mountain House, an office building at Slave Lake, and a cabin for exhibition purposes at the Calgary Stampede grounds.



PLATES 7 AND 8.—TYPES OF BUILDINGS ERECTED BY THE FOREST SERVICE ON THE NATIONAL FORESTS

The upper picture is a ranger's cabin. The lower picture is an office building at a summer resort in one of the national forests.

Timber Sales and Permits.—There are at present in the district sixteen timber sales in good standing, of which nine are new ones awarded during the year. Eight sales completed their operations in a satisfactory manner and have been closed out. The cut has not been exceptionally heavy, owing partly to the fact that the winter was very mild with little snow. Many of the purchasers of new sales were unable for this reason to get operations started this winter and some of the holders of old sales were obliged to leave part of their cut in the woods because of lack of snow for hauling. There has been the usual demand for timber materials under permit. Sales of fuel-wood, fence-posts, poles, building timber, and other products in demand among settlers have been about on a par with previous years.

Reforestation.—An area of somewhat more than 200 acres on the Cooking Lake forest was sown to spruce by the method known as "seed-spotting." An additional area of 20 acres was planted with spruce, Douglas fir, and lodgepole pine seedlings which were grown in the local nursery. The seed-beds prepared two years ago for planting in 1926 were not entirely successful, on account of frost, rodents, and two severe dry periods which occurred at a critical time after the seeds were sown. As a consequence there is a shortage of nursery stock for 1926 planting and only a small area can be covered. On the other hand, the seed-beds planted in the spring of 1925 to furnish planting stock for 1927 have been very successful. Experimental beds of broad-leaved trees were seeded in the spring of 1925 at Cooking Lake. Elm from Saskatchewan, native white birch, and Ontario yellow birch have been successful so far, while Ontario maple proved a failure. A smaller area was planted in the Cypress Hills forest and several seed-beds were started.

Seed Production.—The seed-extraction plant at Rocky Mountain House was put in operation in the autumn of 1925 and continued work throughout the winter. There were collected and extracted 378 pounds of lodgepole pine seed, 158 pounds of white spruce seed, and 15 pounds of Douglas fir seed. Of the lodgepole pine seed, 200 pounds has been shipped to the British Forestry Commission. The operation of the local seed-extraction plant has greatly reduced the cost of producing pine seed.

Surveys.—The Brazeau stock-taking survey covered during the summer of 1925 about 360 square miles. A very valuable map was made showing streams, trails, and forest types. Data were also collected with regard to volume, rates of growth, and other details necessary to complete an estimate of present and probable future stocks. The Clearwater working-plan survey covered intensively an area of 40 square miles in the Shunda valley in the vicinity of Nordegg. Detailed data on this area were collected for the purpose of placing it under intensive management in order to supply timber for the local mines.

Investigative Work.—Sample plots have been laid out in many parts of the district for the purpose of studying natural reproduction of spruce and pine. Studies have also been made of the effect of fire on forest soils and of the source and character of the reproduction which follows fire in the forest.

Thinnings.—Thinning experiments initiated several years ago on the Cypress Hills forest have been continued on the same scale. It has been found that the amount obtained from the sale of the thinned material about equals the cost of doing the work.

Grazing.—During the summer of 1925 there were 598 permits issued for stock-grazing on the forest reserves. These covered 29,499 head of cattle and horses and 3,941 head of sheep. This is an increase of 771 head of cattle and horses over last year, and is the first increase shown in this district since 1920—the heaviest grazing season on record. The greatest increase was in the Cooking Lake forest. There were slight increases in the Cypress Hills and the Crowsnest forest, but a falling off on the Bow River forest.

BRITISH COLUMBIA

The jurisdiction of the Dominion Forest Service in British Columbia is confined to Dominion government lands in the Railway Belt and the Peace River Block. The area in the Peace River Block, however, is not included in the following report as owing to its geographical position it is handled under the Alberta organization.

Fire Protection.—The season in British Columbia started with an early spring and by April 1 there was very little snow left on the lower elevations. Spring rains did not set in and with a period of cool and cloudy weather lasting until the middle of April (when the weather turned clear and very warm), a serious spring fire hazard accumulated during May. Many fires developed in this period but were promptly extinguished. From the latter part of May until the 15th of June hazard conditions improved with cool weather and scattered showers, but towards the latter part of June and throughout July and to the 14th of August very hot, dry weather was experienced. During this period the interior country of British Columbia was visited by a series of dry, electrical storms with high winds which were extremely intense in the Salmon Arm and Revelstoke districts. On the 14th of August showers occurred, with good effect on fire conditions in the interior, but did not relieve the coast situation. Not until the end of September did relief come to that region. The total number of fires for the season was 451. July and August proved to be the peak of the season with 35.7 per cent and 31.9 per cent of all fires occurring in those months, respectively. Railways caused 110 fires (24.4 per cent), the greatest number of fires from any single cause. Fire occurrence from this cause will always be large. It is, however, definitely known where the fires are likely to break out and for this reason a large percentage are extinguished in the incipient stage. Railways are co-operating with the Forest Service fire-protection forces very successfully, and their employees are giving the fullest attention to fires along rights of way. A great improvement has been shown by those employees responsible for the upkeep of fire-protection appliances on locomotives. Lightning caused 109 fires (24.2 per cent of all fires). These were fires mostly confined to the Salmon Arm and Revelstoke fire-ranging districts, the total outbreaks from lightning amounting to 46 (51.5 per cent) and 46 (60.5 per cent) of the fires in those districts, respectively. Careless smokers caused 54 fires (11.9 per cent). Settlers clearing land set 41 fires (9 per cent), the lowest comparative number from this cause since 1921. Fires due to other causes were all lower than for several years, which is a very encouraging condition; particularly is this the case with fires due to incendiarism, which were lower than in any year since 1920.

The distribution of fires by districts is as follows: British Columbia reserves, 102 (of which only 22 were inside the reserves, and 80 outside); Coast district, 83; Salmon Arm district, 111; Revelstoke district, 76; railways, 79.

The effect of the great number of fires caused by lightning shows strongly in the total acreage burned over. During the season this total reached the alarming figure of 139,409 acres, the largest figure in the past eleven years, during which period accurate figures have been obtained and kept on record. In connection with lightning a difficult situation arose occasioned by high winds accompanying the electrical storms, and, despite the best efforts which were put forward to control lightning strikes, a great many of these fires got out of control. It has been demonstrated during the past season that a great factor in the control of lightning fires in high mountain areas is the permanent lookout system. Wherever the lookout personnels had within their visions the areas where lightning strikes occurred the resulting fires were quickly attended to and held down to comparatively small acreage, but the reverse was the case where suitable lookouts did not exist. It is due to uncontrolled lightning fires that the acreage is abnormal. The total loss in merchantable timber (76,597,900 feet board measure) is naturally also the largest for the last eleven years except during the year 1920—a season with a similar occurrence of fire due to lightning. The reason for a decrease in comparison with that year again exemplifies the value of lookouts for detection of fires in large tracts of isolated timber and hitherto inaccessible country, as many of the existing lookouts have been installed since 1920.

Improvements.—Owing to the heavy drain on fire-suppression appropriations, various contemplated permanent improvement projects had to be held over for subsequent years. However, 39 miles of trail were completed on British Columbia forest reserves and 23 miles in the fire-ranging districts, making a total of 62 miles for the Railway Belt. Many miles of trail were gone over during the season and put in good shape. Eleven miles of new line were constructed. A few buildings were improved with minor maintenance repairs.

Silviculture.—At the close of the fiscal year 22 timber sales were in active operation on forest reserves. Fourteen new sales have been awarded and 12 have completed cutting. The railway tie production decreased from 60,000 ties during the previous year to 37,293 ties. Telephone poles, however, increased from 2,000 to 3,508 poles. Some operators took out sawlog material to the extent of 285,967 feet board measure. In the past few years no sawlog material had been taken out on account of an unfavourable market. Timber sale activity has broadened out to other reserves besides the Larch Hills and Mount Ida. Several sales are in operation on the south end of the Fly Hills, Monte Hills, and Martin Mountain forest reserves, along the new branch line of the Canadian National Railway system to the Okanagan.

Although the season was again considered an "off year" generally for seed production, the seed-extraction plant at New Westminster produced the following quantities: Sitka spruce, 1,190 pounds; western red cedar, 56 pounds; western hemlock, 3 pounds; Douglas fir (Coast strain), 10½ pounds; western white pine, 60 pounds; western yellow pine, 14 pounds; western red cedar (Interior strain), 1½ pounds; Douglas fir (Interior strain), 108 pounds. The greater part of this seed was shipped to the British Government and the New Zealand Government. Small shipments were made to various European experimenters, also to foresters in Japan and Africa. Research studies in regard to timber growth and conditions were continued. Some of the sample plots have now been in existence for five years. Re-measurements were taken which are being prepared in report form.

Grazing.—The public interest as shown during the past few seasons in regulated grazing on forest reserves has to a certain extent increased during the past grazing season. There was not a greater number of stock grazed under permit, but the timber-grazing areas on forest reserves saved the situation for some stockmen in the Dry Belt on account of the fact that owing to the extremely dry season the open range suffered to such an extent and forage conditions were so poor that stock had to be driven to the timbered range to carry them over. The actual numbers of stock on forest reserves under permit were as follows: cattle, 1,796 head; horses, 80 head; sheep, 720 head.

Recreational Uses.—The use of forest reserves and other forest areas for recreational purposes is still on the increase. Camping lots and summer cottage lots were in great demand at Paul Lake in the Niskonlith forest reserve. An addition to this summer-resort area was surveyed to meet the popular demand. The fishing in Paul lake continues good in spite of the heavy catch of fish each season. The Trout Lake summer resort on the Long Lake forest reserve was well patronized by the public, and fishing in Trout lake is improving.

Attention was given this year by forest officers in the fire-ranging districts outside forest reserves, to the location of suitable automobile camping sites along the main motor roads. The reasons for establishing such automobile camps are: (1) to provide a service for automobile tourists who do not know the country, and (2) to enable forest officers to keep in touch with travellers and see that they are taking the proper precautions to guard against the spread of fire from camp-fires.

FOREST PRODUCTS LABORATORIES OF CANADA

W. Kynoch, Superintendent

The new scheme for co-operative research between the Government and the pulp and paper industry came into effect officially at the beginning of the year. Under this scheme the industry is to make a substantial annual contribution for a period of from two to five years, to be devoted to extending the investigations of the laboratories relative to pulp and paper. Control of the work is effected by means of a Joint Committee, on which the Government and the industry are represented. The committee is responsible to the Research section of the Canadian Pulp and Paper Association, which, in turn, is responsible to the Association and thence to the industry at large.

Material advances were made during the year in research and related work.

DIVISION OF PULP AND PAPER

The accommodation for pulp and paper work was enlarged by the placing at the disposal of the Laboratories of space in the existing building formerly used by McGill University. This part of the building was reconstructed and the interior was remodelled. Notable additions were made to the equipment for pulp and paper research. A constant-humidity room was installed and completely equipped, as also was a paper-testing laboratory.

Chemistry of Wood.—Object: To study the chemical composition of wood with a view to laying a sound foundation for chemical processes for the manufacture of paper pulp and other products. The primary need is to evolve reliable methods of analysis which will determine the constitution of wood, and it was along this line that effort was chiefly directed throughout the period.

Pulp Testing.—Object: To develop standard methods of evaluating pulps. The scope of the work was extended to include every physical and chemical test adjudged of primary importance in determining the quality of a pulp. In its new form the project may be described as a critical experimental study of the methods of conducting each test, the ultimate object being the development of a detailed method of proved reliability. Work was steadily prosecuted throughout the year and a standard instrument and procedure for the freeness test was developed. A number of these instruments were made under the direction of the laboratories and were purchased by pulp mills.

Use of Magnesite in Sulphite Cooking.—Object: To determine the effect of magnesium base in sulphite cooking liquor on the process and product. A complete survey of the literature pertinent to the study was made. Suitable pulping apparatus was designed, installed, and tested. A general analysis of the problem was made and the method of approach determined and a considerable advance was made in the experimental work.

In addition to the above a number of miscellaneous investigations pertaining to pulp and paper were conducted. These included paper-making trials in co-operation with manufacturers, a large number of fibre analyses of pulps, papers, fibre board, etc., a study of the cause and prevention of objectionable odour in paper towels, and analytical studies of pulp woods.

DIVISION OF TIMBER PHYSICS

Kiln-drying.—Object: To study the fundamental principles involved in the drying of wood by means of kilns, to study the design, construction, and operation of kilns, and to co-operate with kiln-owners in improving drying practice. Special emphasis was laid on co-operation with manufacturers and lumber dealers operating kilns, this work being steadily continued throughout the year. The demand for the assistance of the laboratories in this depart-

ment is increasing, and it is held that the service given tends to promote reduction of waste and improvement of manufactured wood goods. Temporary installation of recording instruments in the kiln enables officers to check operation closely. A small dry-kiln for experimental work at the Laboratories was designed and had been partly constructed by the end of the year.

Equilibrium Moisture Content of Canadian Woods.—Object: Wood tends to come to equilibrium with the conditions of relative humidity and temperature prevailing in the surrounding air. Hence the moisture content of air-dry wood varies according to the climatic conditions of the particular region, and may also vary to some extent with the kind of wood. The object of this investigation is to ascertain what the moisture content of wood of various species actually is when air-dry. Ten species of wood were dealt with, each being represented by a number of test boards. The moisture content of these was determined at weekly intervals, and the relationship between the moisture content and the relative humidity and temperature, as determined by the McGill observatory, carefully noted.

Identification of Birches.—Object: Birch is the leading Canadian hardwood and at present there is no certain method of distinguishing the wood of the yellow birch from that of the paper birch. An intensive study of the anatomy of the two woods was made and structural characteristics found which enabled identity to be determined in the great majority of instances.

Other work relating to timber physics carried out during the year included numerous wood identifications made in response to requests from firms or individuals or necessitated by researches in progress, a study of the cause of "dipping rings" in Sitka spruce, a study of fragments of wood from a creek-bed, submitted by the Geological Survey, with special reference to identity, a large number of tests on the condition of kiln-dried wood for manufacturers and others, inspection and tests of imported timber with reference to compliance with specifications, and the completion of a study of interior air conditions with reference to determination of the correct moisture content for wood for interior finish, furniture, etc.

Pathology of Red Stain and Red Rot in Jack Pine.—Object: Jack pine is an excellent wood for railway ties, its susceptibility to decay by so-called red stain and red rot being one of its few drawbacks. The object of the investigation is to determine the causal fungus or fungi and to ascertain the character of the attack on the wood. Field studies were carried out at certain saw-mills and were followed by extensive cultural and microscopic studies at the Laboratories. The belief that the particular casual organism was *Trametes pini* was confirmed, but other forms appear to be associated with it. An experimental investigation of a preliminary character dealt with the question of whether or not creosote treatment of timber in tie sizes kills the organisms causing red stain.

Reference Collection of Pathological Material.—Object: A comprehensive reference collection is of primary moment in connection with research and investigation into the pathology of woods. Such a collection consists of wood samples of known identity infected with fungi of both known and unknown identity, samples of normal and abnormal fruiting bodies of known and unknown species of fungi, stock cultures of important wood-destroying forms, etc., etc.

The existing reference collection being inadequate, plans were formulated for the building up of a much larger and more complete collection, and the work of collecting the additional specimens is well under way.

Study of Slime in Pulp Mills with Reference to Methods of Prevention.—Object: An organic growth known as "slime" accumulates as a layer in the pipes, head-boxes, storage tanks, etc., of sulphite-pulp plants. If removed, it is rapidly renewed. Portions of the layer are constantly being detached and

carried along in the pulp stream, giving rise to dark spots in the finished pulp which frequently necessitate degrading and a consequent monetary loss to the mill concerned. The object of this investigation was to determine the nature of the organism causing slime and to develop methods of prevention. Studies were made at several pulp-mills, followed by extensive cultural and microscopic studies at the Laboratories. Numerous organisms were isolated and studied and material advances in the research made.

Toxicity to Fungi of Certain Water-Insoluble Substances.—Object: The solubility of salts now extensively used as wood-preservatives greatly lessens their efficiency, as they may be largely removed by leaching from treated wood exposed to the weather. The theory is, however, that solubility in water is, for certain reasons, an essential characteristic of a preservative. The object of this research is to test the validity of the theory. The investigation was planned and work begun shortly before the end of the year.

Miscellaneous investigations of a pathological character included a cultural study on material of Sitka spruce (from aeroplane stock) affected by incipient decay to determine the viability and identity of the causal organism, cultural and microscopic studies on decay in balsam fir, basswood, red cedar, and Douglas fir, respectively, and a survey of the literature bearing upon the isolation of lignin from wood by means of bacteria or fungi.

DIVISION OF TIMBER TESTS

Mechanical and Physical Properties of Canadian Woods.—Object: To establish authoritative data on the strength and certain physical properties of all Canadian timbers of present or prospective industrial importance. The work is necessarily of a comprehensive character and involves not only a large number of tests and determinations for each of the strength functions investigated but also extensive mathematical work. During the period reported upon more than 7,000 tests and determinations were made. The figures obtained from the work are kept constantly up to date and ready for distribution in the form of blue-prints.

Spike-holding Power of Jack Pine Ties Affected by Red Stain.—Object: To determine the relative ability of red-stained and normal jack pine ties to hold railway spikes. The work, which involved several hundred tests and determinations, was completed and results distributed to the railways.

Nail-holding Power of Canadian Woods.—Object: To ascertain the relative ability of leading Canadian commercial woods to retain nails. The work was continued from the previous year.

In addition to the above, working plans were developed for two new major investigations, namely, tests on the strength of Canadian woods in structural sizes, and a comprehensive study on glues and glued joints.

A hazard machine for use in investigative work on the strength of packages and containers was installed, tested, and put into operation.

Miscellaneous work relating to the mechanical properties of woods included tests on boxes and containers of various kinds for manufacturers and shippers, tests on Sitka spruce and white ash for aeroplane construction for the Royal Canadian Air Force and for manufacturing concerns, tests on glues and glued joints, about 400 tests on birch and aspen for ties, and a series of tests on jack pine ties undertaken at the request of the railways.

DIVISION OF WOOD PRESERVATION

Relative Penetrability of Canadian Woods with Creosote Oil.—Object: To secure information regarding the penetrability of commercial woods with creosote oil in pressure treatment. Very few data on this subject as yet exist and such information would be of great practical utility as a guide in the preserva-

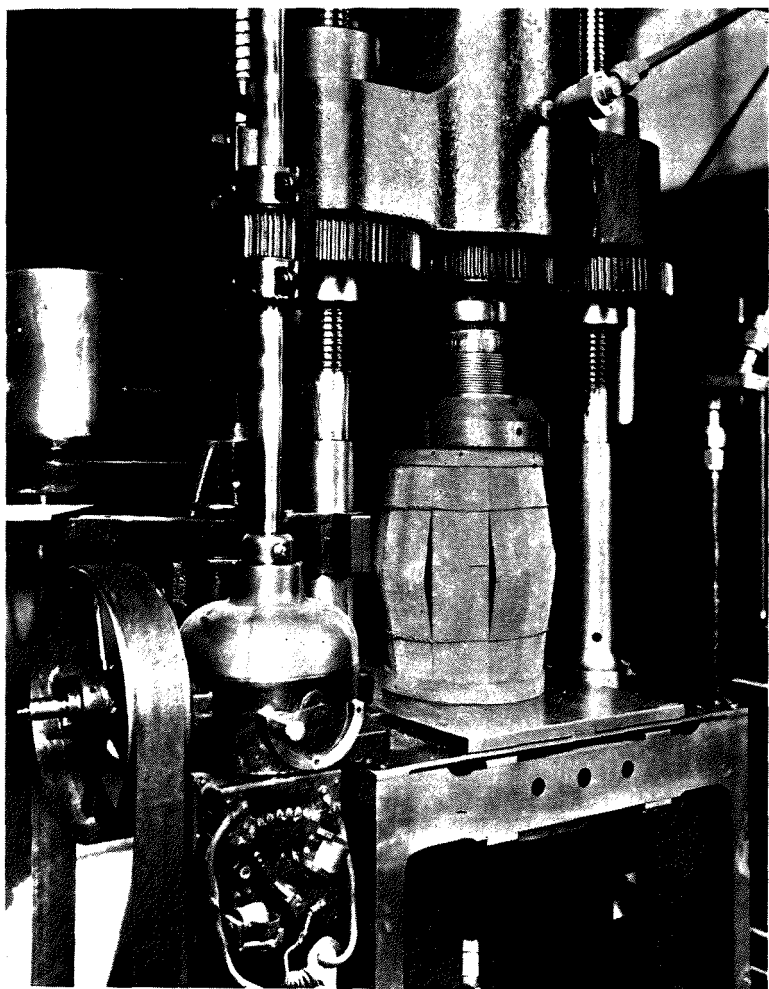


PLATE 9.—TESTING THE STRENGTH OF NAIL KEGS

The illustration shows the method of testing the strength of nail kegs to resist compression at the Forest Products Laboratories of Canada, Montréal, Quebec.

tive treatment of timber for many purposes. Work, begun last year, was materially advanced during the period under review, using the penetrance apparatus designed at the Laboratories. A good deal of time was devoted to an experimental study of methods of preventing or retarding penetration of preservative into the end grain of wood.

Seasoning of Hard Maple Ties for Creosote Treatment with Special Reference to the Effect of Moisture Content when Treated on Checking after Treatment.—Object: To ascertain whether the degree of seasoning at which the ties are treated exercises an important influence on their checking subsequent to treatment and, if so, to determine the optimum moisture content for treatment with regard to minimizing such checking. A well creosoted hardwood tie should be superior to a softwood tie on account of its much higher mechanical strength. The severe checking which frequently occurs in treated hardwood ties in the

track, however, is a serious drawback to their use as it not only reduces their strength but exposes the untreated interior and thus tends to nullify the preservative value of the treatment. An experimental investigation dealing with the effect on penetration of creosote oil in hard maple of treatment at 50 per cent moisture content, by means of incising and steaming, was begun and advanced.

Service Tests of Jack Pine Ties Affected by Red Rot and Red Stain.—Object: To secure dependable information as to the effect of red stain and red rot in jack pine ties on the life of the creosoted ties in the track. Studies conducted by the Laboratories on previous occasions have shown that red stain causes no measurable diminution of the initial strength of the wood so far as ordinary strength functions are concerned. If, however, it occurs in that part of the tie in which the spikes are driven, it reduces the capacity of the wood to retain them. These studies also showed that red rot, if in the earlier stages, and if confined to certain parts of the tie, does not so lessen the mechanical strength as to render the tie unfit for use, initially. There is no information, however, as to the effect of these conditions as the tie continues in use, that is, on the question of the service life as compared with that of unaffected ties. During the year reviewed 400 ties were installed in the track to obtain information on this question. Of these, 200 were typical of the red-stain condition, and the other 200 represented the earlier stages of red-rot. In each group 100 were creosoted according to ordinary commercial practice, the other 100 being left untreated. All ties were numbered and all data pertinent to the test carefully recorded. The ties will be inspected yearly.

Crude Oil-Zinc Chloride Treatment for the Preservation of Wood.—Object: It has been claimed that treatment in which crude oil is injected first and is followed by impregnation with zinc chloride is much more effective in prolonging the life of ties than is treatment with zinc chloride alone. The crude oil, while of no antiseptic value in itself, is said to retard the removal of the zinc chloride by leaching. The object of this investigation was to secure information as to the effectiveness of the crude oil in this direction. A large number of accelerated leaching tests were carried out, carefully matched test-blocks being used. The results indicated that the crude oil was very effective in retarding the leaching of the preservative.

Removal of Plant.—The experimental wood-preserving plant and the chemical laboratory and equipment in connection therewith were removed from their former quarters and installed in a new temporary building at the rear of the Laboratories. The miscellaneous work of the year in the Wood Preservation Division included analytical study of tars and creosote oils, a study of the properties of vertical retort tar as compared with those of the 70/30 creosote tar mixture for tie treatment, development of a laboratory standard method for extracting creosote from treated wood for examination, and work on the effect of impregnation with sugar on the hygroscopicity of yellow birch.

General.—The officer in charge of exhibits was again on duty at the British Empire Exhibition in London, where he was in charge of the Canadian timber exhibit. Work at the Laboratories was confined to maintenance of the permanent exhibit and preparation and distribution of standard specimens of Canadian woods, in response to requests from schools and institutions in Canada and abroad.

A number of addresses were delivered by members of the technical staff at meetings of scientific and trade societies and associations. Short courses in wood technology were conducted on several occasions for technical officers of the Royal Canadian Air Force.

VANCOUVER FOREST PRODUCTS LABORATORY

T. A. McElhanney, Superintendent

The Vancouver laboratory was established in British Columbia to deal with problems of wood utilization in western Canada which require local treatment or which cannot be dealt with to advantage in the Montreal laboratory on account of the great intervening distance and consequent high transportation costs on test material. The most important event in the progress of the work of this laboratory during the year was the removal to the new buildings erected specially for the accommodation of the laboratory by the University of British Columbia on its Point Grey site. Since the inauguration of the Vancouver laboratory in 1918 it has worked under a co-operative arrangement with the University of British Columbia. This agreement was extended during the year for a further period of ten years. The two new buildings will permit reasonable extension of the work of the laboratory and much greater efficiency in conducting work already established.

TIMBER TESTING

Standard Tests.—Tests of the mechanical and physical properties of woods in accordance with standardized procedure were conducted on British Columbia and Alberta woods. In all nearly 9,000 tests and determinations were made during the year. A special blue-print for circulation was prepared showing the results of tests on western woods.

Green-cut and Fire-killed Cedar Poles.—Fire has, at various times, run through valuable stands of pole-size cedar in British Columbia, killing the timber but not destroying it. There is at present practically no market for such material. In order to determine whether any appreciable reduction in strength results from fire-killing, an extensive series of tests on green-cut and fire-killed cedar of full pole size was started.

Lodgepole Pine for Railway Ties.—A shipment of lodgepole pine from interior British Columbia and a similar shipment from northern Alberta were tested to determine relative strength properties of this species from the two districts, especially with reference to its use for railway ties.

Custom Tests.—The laboratory includes in its equipment a 200,000-pound tension and compression testing machine. As this is the only large tension machine in British Columbia, the laboratory has conducted such tests on steel, concrete, and other building materials as could not be conducted by commercial testing firms, and from this source has obtained a small revenue. Over 200 tests of this kind were conducted during the year.

Miscellaneous Tests on Wood.—At the request of the wood-working industries a number of tests on boxes, plywood, door joints, etc., were conducted for local wood-working plants. Over 500 tests of this kind were made during the year.

Tests on Structural Timbers.—A working plan for tests on structural-sized British Columbia timbers was drawn up with a view to commencing work in the near future. A study was made of building codes of the larger Canadian cities with reference to working stresses for timber used in construction.

TIMBER PRODUCTS

Degrade Stresses.—In order to determine losses sustained in saw-mills, planing mills, and dry kilns, the laboratory conducted a study along these lines in co-operation with the British Columbia Lumber and Shingle Manufacturers' Association and prepared a report for this association.

Kiln-drying of British Columbia Softwoods.—A circular was prepared and published dealing with this subject which received wide circulation throughout Canada and in foreign countries where British Columbia timber is marketed.

Survey of Mills of Interior British Columbia.—In order to make the service of this laboratory as widely useful as possible, a representative of the laboratory made a survey of the principal lumber-producing centres of the interior and northern portions of the province. Attention has heretofore largely been confined to problems relating to coast mills.

Kiln-drying Lectures.—At the request of the lumber industry a representative of this laboratory delivered a series of lectures on lumber seasoning in Vancouver and Victoria to lumbermen from these places and surrounding districts. Over one hundred lumbermen attended the course of six lectures.

Experimental Dry-kiln.—Arrangements are being concluded for an experimental dry-kiln of semi-commercial size for investigative purposes as well as for the purpose of demonstrating the principles of dry-kiln design and operation.

Natural Defects.—The significance of natural defects in the grading of lumber is of the greatest importance in the lumber industry. The laboratory has been engaged in the assembly in pamphlet form of all data pertinent to this subject which might assist graders in understanding the relative importance of different natural defects in lumber grading and in knowing how to identify them.

Timber Diseases.—A pathological laboratory has been equipped to permit the study of the stains and decays which occur in the different species, not only in the woods, but also in the lumber yards and in transit, and to devise methods to prevent loss by decay.

Technical Service.—In addition to particular investigations of a major nature, an important public service was rendered through the dissemination of information of a more or less scientific or technical nature regarding wood properties and uses, following inquiries which the laboratory receives in constantly increasing frequency. Work of this nature, during the past year, has been very heavy. Two hundred inquiries of an important nature received attention during the year as well as others of less importance.

Educational.—Members of the staff contributed several articles to the timber trade journals and delivered a number of addresses to lumbermen's educational classes and other bodies.

Co-operation with Entomological Branch.—Accommodation was arranged in the Forest Products Laboratory for a representative of the Entomological Branch of the Dominion Department of Agriculture, who proposes conducting certain investigations regarding insect infestation in coast species, entailing co-operative research work with the laboratory, involving the use of the laboratory testing equipment.