1932.

NEW ZEALAND.

STATE FOREST SERVICE.

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1932.

Presented to both Houses of Parliament pursuant to Section 64 of the Forests Act, 1921–22.

The DIRECTOR OF FORESTRY to the Hon. the COMMISSIONER OF STATE FORESTS.

SIR,— Wellington, 29th August, 1932.

I have the honour to submit herewith the annual report of all operations of the State Forest Service for the year ended 31st March, 1932, as required by section 64 of the Forests Act, 1921–22.

I have, &c.,
A. D. McGAVOCK,
Director of Forestry.

Hon. E. A. Ransom,
Commissioner of State Forests.

CONTENTS.

REPORT.

INTRODUCTION.

BRIEF mention is made hereunder of one or two of the main activities of the Service: the subjects are treated in greater detail in subsequent portions of the report.

Afforestation.—Although the total area established in new plantations is considerably smaller than that for the past few years, it exceeded 40,000 acres, which in view of the difficult economic condition of the country generally must be regarded as fairly satisfactory. The total area of State plantations is now approximately 348,000 acres.

Utilization.—The economic utilization of plantation-thinnings was further investigated, and their manufacture into boxes and crates appears attractive. Sample trees of the typical types and grades offering were recently milled and yielded a highly satisfactory product. Growing appreciation of the value of dry kilns by the sawmilling industry was reflected in the establishment of two new units since last report, one of which, it is interesting to note, was installed for drying box timber. Another for the same purpose was in the course of construction at the close of the year. Timber-trade extension efforts inaugurated during the year for Southland silver-beech were so promising that it was agreed to despatch representatives of the sawmilling industry and Forest Service to Great Britain to continue negotiations there, and two delegates proceeded overseas shortly before this report went to press.

Milling Industry.—It was not expected that the year just closed would show much (if any) improvement in the condition of the domestic market demand for indigenous timber, and unfortunately such has proved to be the case.

As stated in a later portion of this report, the timber-production for the period mentioned will not, it is believed, exceed 140,000,000 ft. b.m., which is 50 per cent. less than the figures for two years ago. It is considered, however, that the figures mentioned must represent rock-bottom, and that a gradual, if slow, recovery can now be confidently looked for.

One pleasing feature of the local market was the increased domestic demand for exotic locally-grown timber for use in the various box-making industries. In this connection it is somewhat significant that, whereas for the past year sawmills operating in native bush were, on the average, cutting only up to 40 per cent. of their normal output, mills working in exotic plantations were reported to be cutting beyond 60 per cent. of their normal capacity.

National-endowment Areas.—It will be seen from a perusal of Table No. 1 that 162,815 acres of our permanent forest areas are national endowment, which means that one-half of the revenue received therefrom shall, after the deduction of reasonable administration expenses, be transferred from time to time, as the Minister may direct, from the State Forests Account to the National Endowment Account (*vide* section 39 of the Forests Act, 1921–22).

This is quite a reasonable provision where forested areas are concerned, but unfortunately a large proportion of these comprises open land already established or about to be established in plantations—land, too, in many cases for which the Service paid considerable sums in compensation. It would be very unfair, therefore, that when these plantations come to maturity one-half of the value of the timber crop should be diverted from the Forests Account, as that account had to bear the whole cost of establishment.

As some of the older plantations will be exploited within the next few years, it is important that early action should be taken to remove the anomaly referred to, even although it should mean the enacting of special legislation.

CHAPTER I.—THE STATE FORESTS.

1. AREAS OF STATE FORESTS AS AT 31ST MARCH, 1932.

TABLE 1.

Region.	State Forests.		Provisional State Forests.		Totals.	Percentage of Total Area in Region under Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	
Auckland ..	159,400	23,161	261,644	72,443	516,648	6·01
Rotorua ..	313,440	111,197	156,631	209,098	790,366	15·72
Wellington ..	799,359	..	161,662	72,189	1,033,210	6·90
Nelson ..	148,508	24,786	1,338,496	723,104	2,234,894	31·78
Westland ..	2,309	..	1,093,247	595,562	1,691,118	43·78
Canterbury ..	332,623	3,671	..	..	336,294	3·38
Southland ..	277,579	..	880,980	67,034	1,225,593	7·22
Totals ..	2,033,218	162,815	3,892,660	1,739,430	7,828,123	11·79

The total area under control at the 1st April, 1931, was 7,763,152 acres, and at the close of the year it had risen to 7,828,123 acres, a net increase of 66,957 acres. The gross increase was actually 89,490 acres (of which an area of 72,657 acres was acquired for afforestation purposes), but this was

offset by the areas withdrawn, which approximated 24,500 acres, and consisted of 21,100 acres made available for settlement under the Land Act and 3,400 acres set aside under the Scenery Preservation Act.

It was found necessary to slightly adjust last year's figures, as the result of recent surveys disclosing cases of overlapping boundaries, incorrect areas, &c. It is inevitable that further instances of this kind will occur as later survey data become available.

The area dedicated to forestry purposes does not yet equal 12 per cent. of the total area of the Dominion, and is still insufficient to supply adequately the future needs of the Dominion.

2. Legislation.

No amendments to the Forests Act, 1921–22, were made during the year under review.

By section 8 of the Reserves and other Lands Disposal Act, 1931, an area of 3,290 acres in Maungatapu Survey District (Nelson–Marlborough Forest Conservation Region) was withdrawn from State forest and made a scenic reserve.

Section 12 of the same Act authorized the cancellation of the reservation as a provisional State forest of an area of 248 acres in Waiwhero and Mawheranui Survey Districts, Westland Forest Conservation Region, in order that it could be set apart for the purposes of Part III of the Coal-mines Act, 1925.

3. Finance.

Receipts.

The forest receipts for the past financial year from all sources were £55,558. Details, together with comparisons with the previous two years, are appended.

TABLE 2.

Item.	1931–32.	1930–31.	1929–30.
	£	£	£
Indigenous-forest receipts—			
Timber-sales	36,320	56,391	60,711
Timber royalties and trespass	3,751	3,538	6,790
Leases—Grazing	1,704	2,093	2,115
Sawmill-sites, industrial, &c.	1,865	1,636	2,850
Miscellaneous	2,249	3,723	9,685
National Endowment Account allocation	6,391	9,866	12,156
Nurseries and plantations—			
Trees and seeds	3,278	5,271	8,082
Firewood and poles		298	1,117
Miscellaneous		1,899	2,131
Totals	55,558	84,715	105,637

The main reason for the decrease in revenue is the continued depressed state of the sawmilling industry, which has resulted in the complete cessation of operations by a number of millers and the working of part time only by others.

Payments.

The net expenditure from the State Forests Account for the past financial year was £275,177, a detailed analysis of which is set out herein, also comparisons with the years 1929–30 and 1930–31.

TABLE 3.

Item.	1931–32.	1930–31.	1929–30.
	£	£	£
Fixed charges and staff salaries—			
Interest and loan expenses	90,223	82,809	59,884
Staff salaries	40,974	49,526	47,817
Allocation of revenue—			
National Endowment Account	6,337	9,495	6,971
Local-body payments	6,416	10,346	11,522
Management, establishment, and development—			
Indigenous forests	12,893	32,331	28,520
Fire-fighting equipment and prevention	1,578	1,454	1,295
Educational—Reference library, &c.	276	742	525
Research and experimental equipment, &c.	1,199	4,867	6,387
Afforestation—Nurseries and plantations	107,795	194,556	248,404
Sand-dune reclamation	110	480	1,689
Land-purchase	6,874	6,361	12,958
Miscellaneous	502	98	1,446
Totals	275,177	393,065	427,418

Interest and loan expenses have increased by £7,414, but net expenditure from the vote has decreased by £125,302, principally in the following items:—

	£
Afforestation	86,761
Staff salaries	8,552
General management charges on indigenous forests ..	19,438
Local-body and National Endowment Account payments	7,088
Research and experimental	3,666

4. State Afforestation.

TABLE 4.

Summary of Operations in Plantations to 31st March, 1932.

Plantation.	Year of Establishment.	New Area planted.	Total Net Area established.	Gross Area of Plantation.	Area remaining to be planted.
		Net Acres.	Acres.	Acres.	Net Acres.
Waipoua	1925	..	301	12,600	11,070
Puhipuhi	1904	52	835	1,559	42
Riverhead	1926	213	10,744	11,852	300
Maramarua	1928	92	11,954	14,166	275
Tairua	1930	5,728	7,586	50,000	37,500
Whakarewarewa ..	1898	..	7,591	10,100	..
Waiotapu	1901	..	7,079	8,003	..
Kaingaroa	1913	22,114	198,746	329,092	92,554
Erua	1930	690	1,002	2,550	1,547
Karioi	1927	2,914	14,708	33,502	..
Golden Downs ..	1927	3,977	13,687	22,464	5,649
Westland	1922	1,106	2,690	7,760	..
Hanmer	1901	47	7,686	10,221	..
Balmoral	1916	239	20,586	24,071	654
Eyrewell	1928	1,855	17,787	19,267	1,076
Blue Mountains ..	1925	..	8,704	9,600	..
Dusky Hill	1893	..	4,382	6,790	..
Conical Hills	1903	..	3,551	3,733	..
Naseby	1900	..	3,308	4,032	..
Pukerau	1915	..	565	628	..
Pebbly Hills	1930	1,982	3,760	5,867	829
Minor areas	..	..	707	3,155	..
Totals ..	..	41,009	347,959*	591,012	151,496

* Does not include 237 acres of direct formation not deemed to be established.

The area planted, 41,009 acres, shows a marked falling-off when compared with the figures for the three previous years, and will probably decline still further for some years to come in accordance with Government policy to taper off the afforestation operations of the Service.

It will be seen from the table that more than half of the area recently established is located on the Kaingaroa Plains, where 92,500 acres are still available for future planting. The next-largest is 5,728 acres at Tairua, Auckland Region; while Nelson, with nearly 4,000 acres (Golden Downs Plantation), was third in point of area.

It will also be noticed that the second-last column of the table shows the gross area of each plantation, and by subtracting therefrom the corresponding figure in the preceding column and making due allowance for the unplanted areas (in the case of those units not yet fully established) some idea is obtained of the extent of the land taken up by roads, fire-breaks, native bush, unplantable country, swamps, officers' quarters, &c.

Plantation Cleaning and Thinning.

As a means of providing work under various unemployment-relief schemes, thinning or cleaning of plantations was carried out during the year on a substantially large scale.

In Southland Region the thinnings were: Dusky Plantation, 326·9 acres; Conical Hills Plantation, 645·8 acres; Pukerau Plantation, 330·5 acres; and in addition 4 acres at Naseby Plantation were treated by plantation employees.

In this region the utilization of unemployed but experienced bush workers enabled thinning to be carried out on a routine system with very little expenditure on marking. All *Pinus radiata* blocks (from 11 to 16 years) were thus thinned with a heavy low thinning, each workman doing his own selection, felling, and trimming of the trees. This was remarkably successful because the men were exceptional, and each, with a lifetime of experience in native-bush work, entered into the spirit of

improvement of the stands for production of a clean final crop. It is, however, distinctly not a precedent to be followed with the usual class of labour obtainable. In compartments of mixed species underscrubbing and thinning was carried out on the fourth-line system, while in remaining areas the crop was completely underscrubbed and given a moderate B grade thinning.

At Hanmer Plantation, Canterbury Region, 932 acres of larch and pine species were thinned by utilization of relief labour. In this locality the subdominant and dominated *L. decidua* (14–23 years) trees are drawn up and slender, and constitute a menace to the remaining crop in heavy snowfalls. Thinnings varying from 25 to 40 per cent. of the original stocking were made by the removal of leaning, malformed, wolf stems, and a few trees of the lower-crown classes.

In *Pinus radiata* (14–16 years) light 18 to 28 per cent. thinnings removed leaning or diseased trees. By selection of the "chosen tree" and removal of the four surrounding ones an approximately 40-per-cent. thinning was given to the *P. laricio*, *P. ponderosa*, and mixed crops.

At Naseby Plantation every eighth line was underscrubbed over 54½ acres of *P. radiata* (15 years).

Utilization.

As stated elsewhere, economic utilization of coniferous thinnings has been achieved at Hanmer, where extracted timber was converted locally into sawn timber, sleepers, and firewood, the latter for local use in institutional furnaces.

At Whakarewarewa Plantation thinning of *Eucalyptus* species for posts and poles has been continued on a small scale by contract, while small areas of *L. decidua*, *P. strobus*, and *P. muricata* have been thinned lightly—chiefly the removal of dead or suppressed stems—by plantation labour for utilization as tent-posts and camp fuel.

Seed-supplies.

Again the Service obtained most of its seed requirements locally and was compelled to secure only 27 per cent. of the total amount from overseas. During the past year 3,750 lb. of seed was added to the seed stocks, and of this quantity 2,730 lb. was collected within the Dominion. Of this total, 540 lb., principally Douglas fir (*Pseudo-tsuga taxifolia*) and Corsican pine (*P. Laricio*), was collected from the State plantations. The balance of 2,190 lb., comprised mainly of *P. radiata*, was supplied by seed-merchants from various private plantations.

It is hardly necessary to point out that, as time goes on and the plantations become more mature, a progressively greater number of trees each year will reach the seed-bearing stage, until eventually the Service will become entirely self-supporting so far as its seed-supplies are concerned.

In this connection it may be mentioned that of recent years the Service has specially planted areas of different species of trees in various parts of the Dominion with the primary object of ensuring that future supplies of suitable tree-seeds may be obtained within its own territory.

Sale of Trees and Seeds.

The discontinuance of sales of trees to the public, a policy decided upon in 1930, has been adhered to throughout the year, so that the only sales effected have been to other Government Departments and to several local bodies. These show a marked decrease from last year, 215,600 trees being disposed of for the sum of £516. The sale of seeds has also shown a large decline, 207 lb. having been sold for the sum of £222. These figures will probably be increased considerably during the coming year, for, owing to a poor Douglas-fir crop in America, a large trial order for seed of this species has been placed by an American firm. This order will be filled entirely by seed collected from thriving and prolific seed-bearing State-forest plantations of Douglas fir.

In order to provide work for unemployed, 1,325,000 trees were distributed to local bodies for planting, at the cost of lifting, packing, and transport only: 1,300,000 of these trees were distributed in the Canterbury Region. It is expected that this practice will be carried out to a much greater extent during the coming planting season.

The usual distribution of trees and seeds to schools accounted for 11,000 trees and 150 lb. of seed.

5. Tree-planting by Local Bodies, Afforestation Companies, etc.

It is estimated that the area planted in trees by private companies is now in the vicinity of 250,000 acres, an increase for the year of 50,000 acres.

The area planted during the year by local bodies is reported to be not less than 6,500 acres, which makes the total area established to date approximately 27,500 acres under corporate control.

The total area of commercial tree-plantations other than those established by the Service is therefore in the vicinity of 277,500 acres.

Reliable information in regard to tree-planting by private individuals is not available, but by the co-ordination of various returns and the information afforded by the "Statistical Report on the Agricultural and Pastoral Production of the Dominion for 1930–31" it appears that farmers and others have established a total area of approximately 64,000 acres of exotic plantations.

This area, of course, cannot be regarded in its entirety as available for the production of timber for commercial purposes, as its establishment is, no doubt, largely in the nature of farm shelter-belts and ornamental plots. It, however, indicates the extent to which farmers and others are seized of the important bearing that adequate shelter has on primary production.

6. Timber Industry.

General.

The disturbed conditions of trade common to all industries were again gravely reflected in the timber-production for the year just ended. That the falling-off in business was even more marked than for the year 1930–31 may be gathered from the fact that whereas for the year 1929–30 the production of sawn timber was (in round figures) 272,000,000 board feet and for 1930–31 it was 229,000,000, for 1931–32 it is believed (final figures are not yet available) that it will not exceed 140,000,000 board feet. In other words, although the fall last year was approximately 16 per cent. as compared with the year 1929–30, it has now increased to 50 per cent. of that year's total.

Of the total sawmills in the Dominion, 88 per cent. cut indigenous timber, but so serious has been the decline in orders that only 20 per cent. of the total number are working full time, 44 per cent. are working part time, and the remaining 36 per cent. are closed down. Sawmills operating in exotic plantations are reported to number sixty, of which at the close of the year, seventeen had temporarily closed down, twenty-two were working half-time, and twenty-one were working full time.

It will be noticed that a greater proportion of mills are working full time in the exotic stands, and this is due to the increased demand for New-Zealand-made boxes and crates and all kinds of containers generally. Mature stands of *Pinus radiata* plantations command a ready sale, and experience has proved that by efficient manufacturing methods shooks can be produced from this species which equal in every respect the best imported article.

Further information regarding the utilization of our exotic timbers will be found in a subsequent chapter of this report.

So far as the indigenous timbers are concerned, the main item of note has been the steady overseas demand for white-pine, and the increased orders placed by Australian buyers during the year have given a temporary fillip to the production of this timber. Unfortunately, the principal stands of white-pine have already been depleted, partly owing to the well-recognized fact that it generally grows on reasonably good farming-country and partly owing to the excellence of the timber for butter-boxes. The remaining supplies are now, of course, more difficult of access, and consequently the logs cost more to extract. So keen is the present demand for this species that millers are reported to be seeking out and buying up isolated clumps hitherto neglected or regarded as worthless and unmarketable.

Timber-sales.

Timber-sales for the year numbered thirty, covering a quantity of approximately 12,240,000 board feet, with a value of £16,435. Corresponding figures for the two previous years were :—

Year.	Number.	Quantity.	Sale Price.
		Board Feet.	£
1929–30	58	60,053,000	73,865
1930–31	56	42,118,024	41,883

This phenomenal decrease is doubtless a reflex of the economic conditions which prevailed in most industries and is a sure indication of the difficult times through which the sawmilling industry has been passing. It may be, however, that the worst phase of the depression, so far as sawmilling is concerned, has now passed, as present signs seem to point to the fact that the prospects of increased overseas orders for such species as white-pine and silver-beech are brighter than for some years past. It is also probable that surplus stocks accumulated by timber-merchants during the " boom period " are now nearly exhausted, and this fact must have an important bearing on future production.

In an endeavour to assist millers to tide over their difficulties and keep their mills working as long as possible, the Service granted another concession (in addition to the ones mentioned in last year's report) by abolishing the payment of 1s. per acre ground-rent hitherto charged on all block sales of timber. In this connection it may also be mentioned that from the beginning of the current fiscal year it has been decided to grant a special rebate of 10 per cent. for twelve months on all payments for timber cut from State forests, provided such payments are made on the date the accounts are presented. Although the year's timber revenue will be adversely affected by this decision, a corresponding benefit will be received by those milling operators who meet their accounts promptly, and in the present age of low price-levels and diminishing trade returns it is felt that this timely gesture from the State will be appreciated by the Sawmillers' Federation as an earnest desire of the Government to share a portion of the losses at present being sustained.

7. Fires and Fire Districts.

Although the summer season was dry and the fire hazard fairly acute in most regions, it is satisfactory to report that, thanks to a vigilant and well-organized fire patrol, the damage caused to the indigenous forests was practically negligible.

The most serious fire occurred at Hanmer Springs, where a settler's fire got beyond control, entered the plantation and destroyed 67 acres of five-year-old *Pinus radiata* trees, valued at £427. Responsibility for lighting the fire was admitted by the settler concerned, with whom a claim for compensation has been lodged.

The only other plantation fire was caused by a change of wind during land-clearing operations adjoining Blue Mountains Plantation, Otago. Through the strenuous efforts of the workmen the fire was extinguished before much damage was done, and was confined to a number of patches within an area of 45 acres.

In North Auckland a fire scorched about 100 acres of six-year-old trees in a private commercial plantation, and in Canterbury another private afforestation company suffered to the extent of about £2,350, 360 acres of trees being destroyed. Severe losses were also sustained by certain local bodies in the same province, the total acreage burned under this head being 236, valued at £2,100.

In Rotorua Region four small fires in the indigenous forest were suppressed without damage to the standing timber. Three of these were due to sparks from a sawmill locomotive.

An equal number of fires was reported from Wellington Region, the most serious of which occurred at Tongaporutu, Taranaki, where 250 acres of second growth in a forest reserve were burned over.

In Nelson the season was dry, but owing to good periodic rains the fire danger was not exceptional. Eleven minor fires were detected in State forests, but none was serious.

Conditions in Westland Region were also favourable from a fire point of view, and no fires in State forests were reported.

In Southland five fires occurred in old workings and burned 126 acres of cut-over bush, but generally the fire danger was normal.

Although not so numerous as heretofore, cases still occur throughout the Dominion of fires being lighted in fire districts during the closed season—*i.e.*, the summer months—without a permit, as required by the Forests Act. Legal action is taken against the offender in every case where definite proof is obtainable, as it is felt that only by such publicity can the gravity of this offence be brought home to the general public.

During the year the most flagrant case of illegal fire-lighting occurred at Conical Hills (Otago), where, despite a prominently displayed warning notice, a party of visitors entered the plantation and lit a fire which might have been attended with disastrous results. The offence was promptly detected, and the offenders were subsequently convicted and fined.

Fire Districts.

Since last report one new fire district has been constituted, to safeguard the plantation now being established in the Tairua-Whangamata district, and the boundaries of two existing districts were extended. This brings the total number of fire districts to forty-two, and the area covered to nearly one-quarter of a million acres.

The total number of private fire districts is the same as quoted in last year's report—viz., eight.

Reports from the various regions indicate that fire districts are still proving an effective method of control, and to this fact, combined with the "prevent forest fires" propaganda carried out in the past, is due in a measure at least the comparative immunity from serious fires enjoyed by the State forests in recent years.

In the main, however, the price of this freedom is, and must always be, eternal vigilance on the part of all field officers during the dry months of the year.

8. Wild Life in State Forests.

A natural result of the scarcity of funds has been a curtailment of the extensive campaign against animal pests inaugurated in 1931. Notwithstanding depleted appropriations, however, the tally for the year is 32,000, chiefly rabbits and hares. In addition to this checked tally, there is the uncountable total of rabbits destroyed by intensive poisoning with phosphorus, and the further 7,162 deer-tails collected on behalf of the Department of Internal Affairs.

A disconcerting feature of this side of the work is the increasing evidence against the opossum as a pest in exotic pine forests. It noticeably favours certain pine species to the exclusion of others, and it became necessary to obtain a special permit to deal with this animal in certain areas, although a general close season was being observed.

Four hundred were killed under this provision, and the very low price of what would two years ago have been a valuable parcel of skins made the operation a dead loss, except from the forest-protection viewpoint. Present indications are that the opossum is detrimental to *Pinus ponderosa* stands of all ages.

The residue of deer-hides from the 1930 campaign was satisfactorily disposed of, some of them furnishing the Department of Scientific and Industrial Research with sample material, which was appreciatively received on the British market and helped to open up a promising channel of disposal. Favourable reference to these hides and their commercial value and properties has been made in the reports of the Imperial Institute.

CHAPTER II.—RESEARCH AND EXPERIMENTS.

1. Forest Parasite Biology.

As is usual in times of economic stress, the Service was compelled to reduce outlay on this most important branch of its work.

As a result of partial reorganization, the Forest Biological Research Station at Nelson was closed soon after its official opening. Forest entomological research on a reduced scale was continued as a function of the Forest Service alone, and the forest mycological section at the Department of Agriculture's Plant Research Station continued without the extensions that had been planned for the year. Despite these handicaps, useful, if restricted, work was done.

Insectary rearing of beneficial and potentially beneficial insect parasites was continued, and pertinent life-history observations were recorded. Liberations were made of the following insect parasites, host-names being added in parentheses: *Rhyssa persuasoria (Sirex noctilio)*; *Anaphoidea nitens (Gonipterus scutellatus)*; *Pseudoleucis benefica (Eriococcus coriaceus)*.

A study was begun of the curious alate but apparently non-migratory forms of *Pineus (Chermes) pini* Börn. that occur in New Zealand in the late spring.

Two entomological papers were published in Vol. 13 of the *New Zealand Journal of Science and Technology*, both dealing with insect parasites of exotic forest-trees. In the same journal was published an article by Mr. L. J. Dumbleton, B.Sc., on spruce-aphis investigation. Reprints of this were issued as the single separate bulletin of the short-lived Forest Biological Research Station.

The mycological work dealt principally with the causal organisms of what has provisionally been termed "pine-wilt" disease. Field symptoms of this condition have been known for some time. Continuous field observations have shown a steady increase in its incidence, although it has as yet never been found of epidemic virulence. Laboratory-work added to the field-work has now established the fact that probably two organisms induce similar symptoms, and that their damage can be closely correlated with climatic conditions. The practical result of the investigation, when completed, will probably be a restriction of the altitudinal limits within which *Pinus radiata* can be successfully grown to timber size. An interesting and significant detail that has been established during the investigation is the occasional infection of internal tissues of coniferous seeds with such weakly parasitic organisms.

Two parasites hitherto unsuspected in New Zealand have been noted, and in one case, at least, will have a marked effect on silvicultural practice. These are an unidentified *Armillaria*, apparently parasitic on native-tree roots and infecting *Pinus radiata* roots in newly felled bush country in the North Island and an *Endothia* species on sweet chestnut in Marlborough.

Studies of mycorrhiza of exotic conifers have been commenced; and a beginning has been made with standardized cultures of decay organisms for determination of toxicity of timber-preservatives.

2. Ecology and Silviculture.

As in past years, organized investigation has centred round kauri in Waipoua and rimu in Westland, although the scale of operations has been somewhat reduced. The inventory and stock map (for kauri only) have been completed for Waipoua Forest, as forecast in last year's report; and, as many misconceptions regarding this area are prevalent, the outstanding features are set out here in tabular form:—

	Acres.
Kauri forest—	
Quality I	5,601
Quality II	1,996
Quality III	1,432
Rimu-taraire forest	14,924
Scrub and open country	14,325
Trial exotic plantations	301
Roads, rides, &c.	106
Total area	38,685

To interpret this correctly it must be remembered that quality classes in this case are based on millable volumes per acre, and that the kauri association is a succession phase and not a forest climax. Quality I areas are, therefore, not rapidly growing and thrifty stands in a silvicultural sense, but, on the contrary, contain a majority of dead and slowly dying giant trees, with aggressive hardwood species ready to succeed at every kauri death. The dying of a kauri is, moreover, a slow process, and the gradual change usually escapes the eye of the intermittent visitor, who is apt to conclude that the kauri forest is everlasting, even in terms of geological and ecological time. An interesting but unfortunate example of the slowness of this death, even when it is much accelerated by human interference, is furnished by the trees near the public road. This road was formed in the period 1926–28, and extreme care was taken by the Public Works Department to prevent all avoidable damage to marginal kauris. Despite this care, many trees along the road are now, after six years, showing unmistakable signs of approaching death. These and similar facts, which were previously matters of opinion, are now being put beyond dispute by recording of constant observations, and the establishment of the Forest Experiment Station is even thus early being abundantly justified. Nineteen special observation plots have been laid out to deal chiefly with different phases of kauri-regeneration and the requisite environment.

In the exotic conifer trial plots a very pleasing matter to record is the success of the so-called southern pines, particularly loblolly and slash pine. Even long-leaf pine shows great promise, and if this group of pines, not cultivable elsewhere in New Zealand on a large scale, can here be successfully established on some of the open country the station, now purely experimental, could readily be commercialized on the probable combination of southern "piney woods" with perpetual regeneration of kauri in the present forest-proper.

The investigations into regeneration of the rimu forests of Westland have been pursued by the investigators, the staff of Canterbury College School of Forestry, despite the decreased funds made available to them. The most interesting results to date will be forthcoming next year, when the first quinquennial remeasurement of the original plots should take place. Associated with this work, although not directly sponsored by the Forest Service, was an investigation into the soil-acidity of Westland rimu forests. A series of twenty-five plots was established, and the soil in each was tested at different seasons and in various horizons. The soil-acidity was markedly high, over 70 per cent. of the surface horizons showing pH less than 4·0; whilst the highest pH value in any horizon at any time was 5·16. This decrease in acidity was correlated with the ingress of the hardwood species of the genera *Quintinia* and *Weinmannia*, succession species to the coniferous rimu.

Of direct bearing on a different aspect of forestry was a paper published by Dr. L. Cockayne, C.M.G., F.R.S., Hon. Botanist of the Service in the *Journal of the Linnean Society*. This highly important paper described the vegetational changes to date on a protection forest area of subalpine *Nothofagus cliffortioides* burned over about twenty-five years ago. Despite no subsequent human interference, the beech has not yet regenerated in the wind-swept subalpine area, and its previous site is now occupied by three distinct shrub associations, each having arrived after a phase of herbaceous subalpine vegetation. The author's conclusion, after twenty-five year's observation of the area, is that the beech is gone for good because of the inhibiting influence of wind at the alpine-scrub zone, although in sheltered ravines at lower altitudes abundant beech thickets have regenerated during the same period.

3. Forest-utilization.

Forest-products research has now progressed to a point where the Service is equipped to report upon both the technical and economic phases of every major forest products activity.

Indigenous Forests.

Practical wood-utilization tests in course of progress during the year included split silver-beech (*Nothofagus Menziesii*) for wine-kegs, sawn silver beech for rifle-stocks and flooring, tawa (*Beilschmiedia tawa*) for clothes-pegs, and creosoted rimu (*Dacrydium cupressinum*) for telegraph-poles.

The silver-beech (*Nothofagus Menziesii*) wine-kegs, now being tested in co-operation with the Department of Agriculture, have proved satisfactory for the first season as regards both tightness and non-tainting properties, but will be kept under observation for some time before any further tests are instituted. Both in Australia and Great Britain silver-beech has also been shown to be promising for rifle-stocks, but the shipments already made for large-scale trials indicate the urgent necessity for better seasoning and grading if the export markets are to be developed to their full capacity.

The tawa (*Beilschmiedia tawa*) clothes-peg tests provide an interesting illustration of the practical value of fundamental research. A study of the mechanical and physical properties of the various indigenous woods, which has been in progress for many years, indicated that the only common species light in colour and in staining, and comparable in cleavage strength with the Canadian birch (*Betula alba*), so widely favoured for clothes-pegs, was tawa. Some timber was, therefore, selected for trial and despatched to North America, where, by courtesy of the U.S.A. Export Machinery Co., it was successfully made up into clothes-pegs, which were returned to New Zealand and submitted to practical tests. These results have since been translated into commercial practice by the establishment of a factory at Hamilton which is now producing tawa clothes-pegs at the rate of 400 gross per day.

Butter-box studies continue to engage the attention of the Service, acting in co-operation with the Dairy Division of the Department of Agriculture. Complaints regarding the tainting of butter by imported Scandinavian spruce (*Picea excelsa*) boxes are numerous, accounting in part for the reduced importations of shooks as compared with last year. In so far as it displaces the Swedish container, the expanding use of the "Saranac" wire-bound white-pine (*Podocarpus dacrydioides*) box constructed of $\frac{1}{4}$ in. material is a welcome development, although inferior in carrying-qualities to the standard white-pine box with $\frac{5}{8}$ in. ends and $\frac{1}{2}$ in. sides, which is preferred by all official dairying authorities both in New Zealand and in Great Britain as the butter-box *par excellence*.

Curtailment of overseas trade-extension work appears inevitable unless local producers are successful in reducing costs and selling-prices to a world-parity basis. The value of most export grades of silver-beech (*Nothofagus Menziesii*), tawa (*Beilschmiedia tawa*), rimu (*Dacrydium cupressinum*), and matai (*Podocarpus spicatus*) on the British markets is about 3s. per cubic foot, equal to £1 5s. per 100 ft. b.m., which returns to the producer only about 10s. per 100 ft. b.m. f.o.r. mill. Special products, of course, command higher prices, with a corresponding return to the New Zealand operator, but the business is only in small parcels. The seasoning and grading of tawa for export present serious problems, which must be solved before any substantial trade can be developed in this species.

Of the field studies in progress, major interest attaches to the development of kiln-drying schedules for white-pine (*Podocarpus dacrydioides*), large quantities of which are being dried in a recently installed commercial kiln of the most modern type. Tentative results show that ordinary

1 in. stock may be dried green from the saw down to 12 per cent. moisture content within seven days, but that yellow-heart requires a much longer treatment. No new air-seasoning studies were inaugurated during the year, but a valuable series of observations has been made over a period of twelve months to establish the equilibrium moisture content of timber used in centrally heated buildings, the results indicating that stock for such use should be kiln-dried down to 10 per cent. moisture content based on oven-dry weight.

The Service test lines of creosoted fencing-posts and telegraph-poles continue to yield valuable data as to the efficiency of the various treatments. All those posts and poles which were properly conditioned and treated, some as early as 1925, are still sound after seven years and likely to remain so for many years more, whereas had they been used untreated all would have been replaced long since.

The first laboratory study undertaken by the State Forest Service—an investigation into the fundamental physical and chemical properties of the indigenous timbers—has been completed after ten year's work, the only minor species excluded from the experiments being puriri (*Vitex lucens*), kowhai (*Edwardsia microphylla*), rewarewa (*Knightia excelsa*), and mountain-beech (*Nothofagus cliffortioides*), all of which are either in restricted supply or of only minor importance. The results will be published during the next year, and structural grades, together with working-stresses, developed for the principal species.

Requests for identification of timber specimens were not as numerous as in past years. The major activity in timber-identification work was the development of a macroscopic key for the indigenous softwoods, and further testing of the microscopic key developed for the *Nothofagus* species last year.

The Dominion Federated Sawmillers' Association has also contributed a substantial sum towards the purchase of equipment for testing the fire-resistance of indigenous timbers and the efficacy of fire-resisting treatments. Some of the equipment has already been received, and immediately the apparatus is complete a comprehensive series of tests will be inaugurated, the major objective being the determination of suitable species and treatments which will enable the locally-grown woods to better compete with the imported woods at present used for their fire-resisting properties.

Exotic Forests.

Contrary to public opinion, the development of markets for the yield from exotic plantations does not present as difficult a problem as in the case of many of the indigenous timbers. The species commonly established are so easily sawn, conditioned, preserved, or otherwise used, and suitable for such a wide variety of purposes in which large volumes of wood are absorbed, that once regular log-supplies become available, they will dominate the principal softwood markets, with the exception, naturally, of that for joinery and finishing timbers, &c. So rapidly, indeed, have the exotic pines advanced in public favour during the last two years that the supply of mature logs from private plantations and windbelts promises to be exhausted long before similar supplies are available from the State plantations—a position which will simplify the problem of disposing of the intermediate products or thinnings.

The development of a market for thinnings has been a major project for several years. Practically every major avenue of utilization has been explored, from wood distillation and preservation to pulpwood and sawing, and it is clear that the only one showing any distinct possibility of economic success is the sawing of the material for boxes and crates with European machines especially developed for this purpose. Evidence of the wide field for such products is found in the fact that during the year over a million apple-cases were manufactured from insignis pine (*Pinus radiata*), several hundred thousand fruit-boxes for the Pacific Islands fruit trade, over one hundred thousand benzine-cases, and several hundred thousand cheese-crates, besides numerous other containers, which have assisted to increase the production of the pine timbers (*Pinus* spp.) from only 4,000,000 ft. b.m. in 1918–19, equal to less than 1 per cent. of the total production of all species, to an estimated figure of 15,000,000 ft. b.m., equal to 12 per cent. of the production in 1931–32.

Of the practical field utilization experiments with exotic timbers, the more important include the kiln-drying of insignis pine (*Pinus radiata*), and service tests of larch (*Larix decidua*) butter-boxes and of creosoted fencing-posts. Schedules have been developed for the kiln-drying of insignis pine, which may be conditioned rapidly at temperatures up to 200° F. without excessive degrade, 1 in. stock having been dried regularly green from the saw down to a moisture content of 12 per cent., based on the oven-dry weight, in about four days. Following upon the successful storage of butter in boxes constructed from locally-grown European larch during 1930–31, a shipment of these boxes was despatched to London in January, 1932, and is now under observation in London by New Zealand dairying officials, who are also watching the Australian experiments designed to allow the use of insignis pine for butter-boxes. The pine, larch, and eucalyptus fencing-posts, some of them treated as long ago as 1921, show that when creosote is properly applied a long life is assured, all those so treated being still sound after ten years use and likely to remain so for many years more.

As with indigenous species, studies have been continued into the fundamental physical and mechanical properties of the principal exotic woods. In the case of insignis pine, a series of structural tests has enabled this work to be translated into commercial use by the publication of structural grading rules with recommended working-stresses.

CHAPTER III.—THE TIMBER TRADE.

1. Markets.

A weaker tone prevailed upon both the domestic and export markets during the year than at any previous period during the present century, the industry producing at only about 25 per cent. of capacity.

Although building-costs continue to decline to new low levels for the post-war period, the general lack of confidence in the economic situation, coupled with excessive unemployment, has seriously restricted all constructional activities, the number of permits issued in the larger towns for new dwellings totalling only 1,100, as compared with 2,700 during the previous twelve months and with 7,200 during the peak period of 1926–27. The total dwellings erected in the Dominion probably did not exceed 1,400, indicating a deficiency of about 2,000, since some 3,500 dwellings are required normally to house the natural increase of population. While the trend is still downwards and the deficiency largely offset by crowding and double-banking of families during the depression, there is no large surplus of dwellings as measured by normal housing standards.

The domestic market for boxing and crating timber displayed a firm tone during the year, a not altogether unexpected increase in demand resulting from heavy exports of dairy-produce and fruit shipped in locally-manufactured shooks in place of the imported containers previously used. Insignis pine (*Pinus radiata*) continues to grow in favour for boxing and crating purposes, the greater part of the Dominion's fruit exports and about 35 per cent. of its cheese exports being shipped in containers manufactured either wholly or in part from this timber. The development of a local petroleum tinning business has also opened up a wide field for the species, and it is already apparent that in the near future, if it has not already occurred, insignis pine will dominate the markets for boxing and crating timber.

Reduced constructional activities by all governmental agencies, both central and local, have not improved the demand for other forms of forest produce, but the policy of purchasing locally-produced sleepers and poles, &c., has been pursued wherever practicable.

As predicted in the last annual report, the British and international exchange position, together with wages and price readjustments, have enabled the local millers to compete more effectively with the imported woods than at any other time during the post-war period. Practically the whole of importers' commitments made prior to the depression were worked off during the year, and consumers forced by general trading-conditions to resort to hand-to-mouth buying and placing their requirements locally. Thus, while the imports for the calendar year 1931 total only 19 million ft. b.m., and were the lowest since 1920, for the current year ending December, 1932, they promise to register a still lower record, the figures for the first quarter being less than 2 million ft. b.m.

The export of only 18 million ft. b.m. during the calendar year 1931 is the lowest on record since 1883, but represents an adverse foreign-trade balance of only 1 million ft. b.m., which is the smallest since 1922. It resulted largely from the general depression and overstocking of white-pine (*Podocarpus dacrydioides*) in Australia; but the sudden revivial of demand in the first quarter of 1932, during which 6 million ft. b.m. were shipped as compared with only 2 million ft. b.m. during the corresponding period last year, suggests that exhaustion of stocks has at last occurred, and that supplies must be renewed. Despite considerable research in Australia to locate timbers suitable for butter-boxes, and attempts to disparage the value of white-pine (*Podocarpus dacrydioides*) for this purpose, the Commonwealth continues to use the New Zealand wood in preference to all others. Based upon the foreign timber-trade returns for the first quarter of 1932, there is a favourable trade balance of 5 million ft. b.m., which augurs well for the export trade for the year.

2. Industrial Technique.

Most mills have operated at such a low percentage of capacity and have found their liquid position so difficult that there has been little opportunity to invest in new equipment and improve logging and milling technique, the one exception being those mills engaged in box-manufacturing operations. Nevertheless, the urge to achieve economies in production is stronger than ever, and progress, though slow, is sure. With restricted markets the emphasis is growing upon such phases as will secure extra sales, and for this reason the outstanding development of the period has been the installation of two modern kilns—one by Messrs. William Cook and Sons, Ltd., Petone, Wellington, and the other by the Kiln-dried Timber and Joinery Co., Ltd., Dunedin. The former is already operating, and the latter expected to be in use by the middle of 1932. A number of operators continue to attempt artificial drying with inefficient equipment and control. Wood-users are therefore warned, as previously, that in purchasing kiln-dried timber they should require a guarantee that the wood has been conditioned in a kiln properly equipped with humidity- and temperature-control apparatus, and operated by a trained attendant, and a certificate as to moisture content and case hardening. Otherwise they will be liable to severe losses due to poor kiln drying.

3. Statistics.

In conformity with the procedure established last year, the use of footnotes has been extended to replace the usual text accompanying the following tables relating to production, imports, and exports.

TABLE 5.

REPORTED PRODUCTION OF ROUGH-SAWN TIMBER.

(From information supplied by the Government Statistician. All figures refer to the years ended 31st March, 1929–31.)

Species.	1929.				1930.				1931.			
	Quantity.	Tota Mill Value.	F.o.r. Mill Value, 100 ft. b.m.	Percentage of Total Quantity.	Quantity.	Total Mill Value.	F.o.r. Mill Value, 100 ft. b.m.	Percentage of Total Quantity.	Quantity.	Total Mill Value.	F.o.r. Mill Value, 100 ft. b.m.	Percentage of Total Quantity.
	Ft. b.m.	£	s. d.		Ft. b.m.	£	s. d.		Ft. b.m.	£	s. d.	
Rimu	156,240,000	1,264,600	16 2	57·9	163,293,000	1,384,540	16 11	57·8	124,999,000	996,060	15 11	54·5
White-pine	56,790,000	466,180	16 5	21·0	58,506,000	485,880	16 7	20·7	49,000,000	380,210	15 6	21·3
Matai	15,753,000	156,220	19 10	5·8	17,972,000	182,460	20 4	6·4	13,917,000	124,950	17 11	6·1
Kauri	10,743,000	213,250	39 8	4·0	10,471,000	190,930	36 6	3·7	8,943,000	160,630	35 11	3·9
Totara	8,611,000	119,510	27 9	3·2	9,046,000	115,250	25 6	3·2	9,468,000	113,680	24 0	4·1
Beech	9,846,000	78,360	15 11	3·6	10,225,000	76,620	15 0	3·6	7,681,000	63,220	16 6	3·3
Insignis pine.. ..	9,168,000	69,820	15 3	3·4	10,382,000	79,700	15 4	3·7	12,740,000	95,470	15 0	5·6
Miro	563,000	4,850	17 3	0·2	959,000	6,970	14 6	0·4	1,078,000	8,260	15 4	0·5
Tawa	300,000	2,410	16 1	0·1	385,000	2,970	15 5	0·1	455,000	5,200	22 10	0·2
Rata	228,000	3,280	28 10	0·1	215,000	3,010	28 1	0·1	294,000	4,400	29 11	0·1
Other	1,972,000	20,870	21 2	0·7	951,000	5,560	11 8	0·3	893,000	13,420	30 0	0·4
Totals ..	270,214,000	2,399,350	17 9	100·0	282,405,000	2,533,890	17 11	100·0	229,468,000	1,965,500	17 2	100·0

TABLE 6.

EXPORTS OF SAWN TIMBER(1) AND OTHER FOREST PRODUCE.

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1929–31.)

Item.	1929.			1930.			1931.		
	Quantity.	Value.		Quantity.	Value.		Quantity.	Value.	
		Total.	Per 100 ft. b.m.		Total.	Per 100 ft. b.m.		Total.	Per 100 ft. b.m.
	Ft. b.m.	£	s. d.	Ft. b.m.	£	s. d.	Ft. b.m.	£	s. d.
White-pine(2)	30,493,000	317,990	20 10	19,187,000	206,030	21 6	14,807,000	136,450	18 5
Rimu(3)	3,122,000	27,140	17 4	3,501,000	30,690	17 7	929,000	6,860	14 9
Beech(4)	3,016,000	39,700	26 4	1,974,000	26,070	26 5	740,000	9,510	25 8
Kauri(5)	2,123,000	51,040	48 0	1,088,000	27,950	51 4	451,000	12,740	56 6
Other(6)—									
New Zealand	349,000	3,470	19 11	926,000	9,850	21 3	607,000	7,070	23 4
Foreign	51,000	610	23 0	21,000	210	20 0	19,000	280	29 5
Totals	39,154,000	439,950	22 6	26,697,000	300,800	22 6	17,553,000(7)	172,910	19 8
			Per Ton.			Per Ton.			Per Ton.
	Tons.	£	£ s. d.	Tons.	£	£ s. d.	Tons.	£	£ s. d.
Kauri-gum	4,937	267,610	54 5 0	3,818	189,640	49 12 0	3,058	128,090	41 17 9
Tanning-bark	53	900	16 19 7	99	1,250	12 12 5	55	690	12 10 11
Fungus	76	9,200	121 1 0	90	11,400	126 13 7	92	9,990	108 11 9

(1) 96 per cent. exported to Australia; remainder to Pacific islands and United Kingdom.
(2) Exported for butter-boxes, shelving, whitewood furniture, &c.
(3) For floorings and linings.
(4) For motor-bodies, agricultural implements, and wood-turnery.
(5) For flooring, linings, tanks, vats, &c.
(6) Includes matai for flooring and linings for Australia, and insignis pine for fruit-cases for Pacific islands.
(7) Decrease due to heavy imports by Australia of white-pine during the previous two years. Orders and inquiries for the first three months of 1932 are considerably in excess of those for the corresponding period of 1931.

TABLE 7.

IMPORTS OF SAWN TIMBER AND OTHER FOREST PRODUCE.

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December, 1929–31. Value represents value in country of export, plus 10 per cent.)

Item.	1929.			1930.			1931.		
	Quantity.	Value.		Quantity.	Value.		Quantity.	Value.	
		Total.	Per 100 ft. b.m.		Total.	Per 100 ft. b.m.		Total.	Per 100 ft. b.m.
Hardwoods—	Ft. b.m.	£	s. d.	Ft. b.m.	£	s. d.	Ft. b.m.	£	s. d.
Australian hardwoods	22,116,000	334,450	30 2	33,943,000	501,910	29 7	9,707,000(1)	118,850	24 6
Oak	2,514,000	66,670	53 2	2,329,000	62,990	54 0	716,000(2)	17,870	50 0
Ash, hickory, &c.	161,000	6,700	83 2	169,000	7,150	84 7	57,000(2)	1,690	59 4
Totals	24,791,000	407,820	32 11	36,441,000	572,050	31 5	10,480,000	138,410	26 5
Softwoods—									
Douglas fir	16,188,000	113,840	14 1	12,807,000	87,760	13 9	2,950,000(3)	13,590	9 3
Redwood	11,678,000	130,310	22 4	9,345,000	100,910	21 7	1,028,000(3)	11,320	22 0
Hemlock and spruce	4,108,000	39,580	19 3	6,142,000	51,010	16 7	662,000(4)	5,710	17 3
Butter-boxes	3,147,000	42,530	27 0	4,691,000	63,620	27 2	2,879,000(5)	38,160	26 6
Cheese-crates	1,373,000	15,210	22 2	1,774,000	18,240	20 7	732,000(6)	6,830	18 9
Cedar	1,335,000	13,530	20 3	637,000	7,210	22 8	52,000(3)	620	23 10
Total softwoods	37,829,000	355,000	18 9	35,396,000	328,750	18 7	8,303,000	76,230	18 4
Other	210,000	7,140	68 0	257,000	6,170	48 0	90,000	3,920	87 2
Grand totals	62,830,000	769,960	24 6	72,094,000	906,970	25 2	18,873,000	218,560	23 2
	Number.	£	Per 1,000.	Number.	£	Per 1,000.	Number.	£	Per 1,000.
Laths, palings, shingles, &c.	14,215,000	20,230	28 6	7,777,000	10,540	27 1	1,727,000	4,120	47 9
	Tons.	£	Per Ton. £ s. d.	Tons.	£	Per Ton. £ s. d.	Tons.	£	Per Ton. £ s. d.
Tanning-bark	1,918	23,210	12 2 0	2,531	30,080	11 17 9	1,166	11,933	10 4 8
Wood-pulp	4,327	50,650	11 14 0	3,762	40,520	10 15 2	3,814	31,814	8 6 10

(1) Decline due to decreased Public Works activities.
(2) Decrease owing to general business depression.
(3) Decrease is in sympathy with reduced building activities.
(4) The active competition of insignis pine for export fruit-cases has accounted for this decrease.
(5) Mostly Scandinavian spruce. As a result of adverse experience on the London butter market the quantities used are decreasing in favour of white-pine.
(6) Mostly Pacific Coast hemlock, which is being replaced by insignis pine and white-pine.

CHAPTER IV.—GENERAL.

1. Forest Reconnaissance, Demarcation, and Surveys.

Indigenous Forests.

Forest Inventory.—The assembling of the quantities of timber resources of the indigenous forests in Auckland Region was completed by the regional staff. The areas include State forests, provisional State forest, Native land, Crown land, and freehold land. A re-estimate of the timber in Waipoua Kauri Forest was also completed by the Silviculturist.

Forest Reconnaissance.—Field operations have of necessity been curtailed owing to the prevailing financial stringency, but field officers have been fully occupied in attending to overdue office-work, plotting of plans, preparing reports, and calculating timber quantities, &c.

In Wellington, Westland, Canterbury, and Southland Regions areas totalling 26,000 acres and containing 195,500,000 super. ft. of timber were surveyed.

With a view to further reconnaissance surveys, areas were explored in Nelson and Southland Regions.

Demarcation.—A total of 4,500 chains of State-forest boundary-lines were surveyed through indigenous forests.

Bush-tramways Surveys.—Chain and prismatic-compass surveys were made in fixing the position of 2,700 chains of bush tramways.

Timber Cruising.—In State and provisional State forests 3,500 acres were cruised. The total quantity of timber on these areas was estimated to be 28,700,000 ft. b.m.

On areas where the timber quantities were evenly distributed approximately 10 per cent. of the timber was appraised by using the system of cruise-lines, cut parallel 10 chains apart through the forest, but on areas where the timber was very patchy 100-per-cent. cruises were generally carried out.

Afforestation Areas.

Topographical and Layout Surveys.—Topographical surveys were made over an area of 73,700 acres, of which 61,100 acres were subdivided into compartments. A total of six plane-table parties operated in Auckland, Rotorua, and Nelson Regions.

The cost of maintaining many of the internal fire-breaks has proved to be too high, and it has therefore been decided to eliminate many of the fire-breaks by planting them up with suitable trees.

Subject to conforming with topographical features, the maximum area of compartments was raised from 240 acres to about 800 acres.

Efficient fire-breaks will, as heretofore, be kept on boundaries and along formed public roads, from which the main fire danger is likely to arise.

Road and Track Construction.—Plantation roads aggregating 70 miles in length and 7 miles of access tracks were located, constructed, and surveyed.

2. Forest Atlas.

During the year ninety-one general-purpose plans and three atlas maps were recorded under the permanent forest atlas. The maps prepared pursuant to section 25 of the Forests Act, 1921–22, now cover an area of 1,173,672 acres, or 14·8 per cent. of the area under control.

In connection with the plantations five topographical plans and eighteen species plans were completed, and additions made to existing plans, while sixty-five white prints were coloured to indicate the species planted. Six plans showing cleaning and thinning operations were also prepared.

Seven hundred and twenty-five helio prints and 241 photostat prints were prepared by other Departments for the Service, and of these 269 and 155 respectively were for use by the Regions. One map of opossum blocks was lithographed and 500 copies printed.

3. Photographic Record.

New negatives totalling 609 were added to the existing records, and include 199 taken by the Hon. Botanist, Dr. Cockayne, at various times during the past thirty-one years. This is a very valuable collection, and the thanks of the Service are extended to the eminent ecologist for his gift.

Photographic work involved the taking of 114 photographs, developing 114 plates, 6 spools, and 3 film-packs, and printing 99 prints and 2 enlargements.

4. Publications.

Leaflet No. 17, "The Properties and Uses of Rimu": 1,000 copies.
Circular No. 32, "Insects infesting *P. radiata* in New Zealand": 1,000 copies.

5. Reference Library.

The reference library has been increased to the extent of some three hundred publications during the year, and represents an authoritative source of information on all branches of forestry and allied subjects. Acknowledgements must be made for the many contributions from overseas Forest Services and for their valuable co-operation in developing a system of mutual exchange. This arrangement is especially valuable at the present time, and enables the Service to keep abreast of current forestry practices all over the world in a manner which would not otherwise be possible.

6. Unemployment Relief.

Forestry-work is recognized the world over as being peculiarly suitable for relieving unemployment, and once again the Service was called on by the Government to expand its normal tree-planting programme in order to provide as much work as possible and utilize a maximum labour complement during the months of winter and early spring, when, as a rule, most other outside activities are suspended.

The work was carried on from four to five months, and during that period 2,000 individual workers were given employment. Excluding foremen, leading hands, and skilled workmen, the labour engaged was wholly composed of relief workers, recruited by the labour bureaux, and an average of 700 hands was maintained over the whole term.

At the peak of the planting season 1,400 men were engaged, of which 1,100 were relief workers, and, generally speaking, they proved to be reasonably efficient.

7. Honorary Forest Rangers.

Six honorary rangers were appointed during the year, and two resigned. This brings the total strength to 135.

It is pleasing to place on record again the very valuable assistance rendered by the honorary rangers throughout the Dominion. Without such voluntary help the work of the official field staff would be much increased, and the supervision at present being exercised over some of the remotely situated forests would of necessity be severely curtailed.

APPENDIX.

SUMMARIZED REPORTS ON STATE AFFORESTATION.

Auckland Region.

Nurseries.—The main nursery operations are now confined to the afforestation project at Tairua, and during the year the nursery at Wharekawa was extended and used for lining-out purposes and for line sowing of *Pinus radiata*, the original nursery being used for bed sowing.

Germination results were good, but some losses occurred with the bed-sown species, and it would appear that the soil must be deficient in some constituent essential to the production of sturdy stock. Two dry summers in succession have been experienced at this station, and this has, no doubt, had an adverse effect upon the nursery operations.

Plantations.—With the exception of some necessary blanking at Riverhead and Maramarua, tree-planting is now concentrated at Tairua Plantation, where approximately 37,000 acres remain for future use. The new area established at this station was 5,728 acres, which brings the total establishment to date to 7,586 acres.

Rotorua Region.

Nurseries.—Weather favourable to tree-growing was experienced generally throughout the region during most of the year, and, on the whole, most satisfactory results can be recorded. Approximately 4,025 lb. of seeds were sown, and the total crop is estimated to produce 26,360,000 trees. The total number of trees in all nurseries, including 30,000 poplar-cuttings, is estimated to be 50,835,000, of which approximately 50 per cent. are available for the current year's planting; 640,000 trees are available for disposal, and the remainder will be carried over to next year.

Plantations.—The new planted area aggregated 22,114 acres, with 14,894,500 trees, or an average of 674 trees per acre. Notch planting was the method principally used, but 284 acres were pitted previous to planting. *Pinus radiata* constituted 68½ per cent. of the species used, while *Pseudotsuga taxifolia* comprised 11⅕ per cent. and *Pinus ponderosa* 9 per cent., the balance being made up of *P. Laricio, Sequoia sempervirens, Cupressus japonica, C. Lawsoniana, Tsuga heterophylla*, &c.

Blanking was carried out over an area of 211 acres, and 45 acres were replanted.

Tree and Seed Sales.—Trees sold to Government Departments, local bodies, &c., numbered 98,000, while the revenue received therefrom was £394. Receipts from the sale of tree-seeds amounted to £107.

Wellington Region.

Nurseries.—At the 31st March the total tree stocks (including 10,500 poplar-cuttings) were estimated to be approximately 6,250,000, the preponderating species being *Pinus ponderosa* and *P. Murrayana*, with lesser numbers of *P. sylvestris*, *P. Laricio*, *Larix decidua*, *P. Banksiana*, &c.

It is anticipated that round about five and a half million trees will be available for planting during the coming season. The nursery at Putorino, Hawke's Bay, was transferred to the Native Department as from the 1st September, 1931.

Plantations.—Tree-planting at Karioi was commenced late in May and finished towards the end of October, with a total area of 2,914 acres. Blanking accounted for 24 acres, while 54 acres of *P. radiata* 1928 planting was interplanted with *P. ponderosa*. Over 90 per cent. of the new area was planted with *P. Laricio*, *P. ponderosa*, *P. Murrayana*, and *P. sylvestris*, in that order. Generally speaking, a satisfactory strike resulted over the whole area.

Nelson Region.

Nurseries.—Owing to the extremely unfavourable weather conditions, nursery operations at Golden Downs were not carried on so successfully as in previous years. Rain made the cultivation of ground almost impossible, and shortly after lining-out commenced strong drying winds were experienced. One hundred and eighty-four pounds of seed were sown, mainly Douglas fir and *Pinus ponderosa*, and although the latter species showed an excellent strike, it was later attacked by "pine-wilt" and some losses occurred. At the time of writing there was a marked decrease in the number of trees being attacked.

Plantations.—The planted area at Golden Downs was extended by 3,977 acres, including 415 acres of underplanting in native forest. Planting began in June and finished early in October, and, although favourable climatic conditions obtained during the planting-season, a severe spring drought followed and was responsible for some heavy losses, more particularly with respect to the *Pinus radiata*, which was the species most used and covered an area of 1,693 acres. *P. Laricio* was also in some demand, and 1,005 acres were planted with this species. The usual maintenance-work was carried out at Dumgree.

Westland Region.

Westland Nursery.—Seed-sowing having been discontinued at the nursery, the work for the year was confined chiefly to the second- and third-year-old tree crops. The stock at present is estimated to total 3,521,650 trees, being *Pinus ponderosa*, two-year-old, 3,042,000; *Cupressus Lawsoniana*, two-year-old, 47,300; *Thuya plicata*, 380,500; *Pseudotsuga taxifolia*, 51,500, &c.

Generally speaking, all species in the nursery have made good growth, although the *Cupressus Lawsoniana* are scarcely as well forward as the other species.

Westland Plantation.—The principal work for the year was the establishment of 1,106 acres of new plantation. *Thuya plicata* seedlings were the only trees used, as past experience has proved that this species is the most suitable for the locality. The spacing generally adopted was 4 ft., in rows 8 ft. apart.

Canterbury Region.

Nurseries.—The stocks at Balmoral Nursery at the close of the year were (in round figures) 4,600,000 trees. The trees lifted and disposed of from this nursery during the year numbered 6,700,000.

At Eyrewell Field Nursery 3,507,600 trees were lifted and put out in the plantation. The stocks on hand at the 31st March, 1932, were estimated to total 412,000 usable trees.

Plantations.—The total area planted for the year was 2,141 acres, distributed as follows: Eyrewell, 1,855 acres; Balmoral, 239 acres; and Hanmer, 47 acres. The percentage of strike averaged: Hanmer and Balmoral, 60; Eyrewell, 80. At the close of the 1932 planting season all the land at present available will be planted up. In the older plantations maintenance-work was carried out as far as funds permitted.

Southland Region.

Nurseries.—No seed-sowing was undertaken during the year, and the only nursery-work carried out was general maintenance at Tapanui.

Plantations.—In this region tree-planting is now confined to Pebbly Hills project, and during the period under review 1,982 acres of new planting were completed. A small area at this station still remains to be planted. Thinning, cleaning, &c., were put in hand at Conical Hills, Dusky, and Pukerau Plantations, as an unemployment-relief measure; but this is referred to in detail in an earlier portion of the report.

Approximate Cost of Paper.—Preparation, not given; printing (1,940 copies), £27.

By Authority: W. A. G. Skinner, Government Printer, Wellington.—1932.

Price 9d.