1939.

NEW ZEALAND.

STATE FOREST SERVICE.

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1939.

Presented to both Houses of the General Assembly pursuant to Section 64 of the Forests Act, 1921-22.

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

SIR,— Wellington, 1st July, 1939.

I have the honour to present herewith, pursuant to section 64 of the Forests Act, 1921–22, the annual report of all operations of the State Forest Service for the year ended 31st March, 1939.

During this period the administration of the Department was in the hands of Mr. A. D. McGavock, who retired on 30th June, 1939, after having completed nearly forty-eight years in the Public Service, including eight years as Director of Forestry.

I desire here to place on record a few figures and facts which indicate in some slight measure the progress made under Mr. McGavock's administration. The area of permanent State forests was doubled, rising from 2,126,837 acres to 4,784,419 acres, whilst the total area under Service control rose from 7,761,166 acres to 8,354,861 acres. Rough-sawn timber cut from State forests in 1930–31 increased from 24·9 per cent. of the total Dominion cut to 36·2 per cent. in 1938–39.

Revolutionary fire prevention and control methods, selective logging in both indigenous and exotic forests, kauri-forest-management plans, utilization of exotic forest thinnings, improved accommodation for forest workmen were all successful accomplishments during a strenuous tenure of office, and fittingly conclude an official career of conspicuous loyalty and devotion to duty.

I have, &c.,

Hon. Frank Langstone,
Commissioner of State Forests.

ALEX. R. ENTRICAN,
Director of Forestry.

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REPORT.

SUMMARY.

A few salient points of general interest concerning the year's operations are quoted hereunder:—

Exotic Forest Establishment.—In round figures, the total area of exotic State forests comprises 430,700 acres. With the major areas all fully planted up, the Service has for the past few years been operating on a very restricted programme. Whilst only 2,711 acres of new planting were completed, 6,250 acres of blanking, interplanting, and replanting were also undertaken. Statistics of the year's planting are embodied in Table 6 of the report.

Timber Sales.—A slight falling off in the sale of timber from State forests was noticeable when compared with the previous year's totals—the biggest reduction (13,200,000 ft.) occurred in Westland. The volume of timber sold was 90,292,600 ft. board measure, and the sale price was £104,821.

Timber-production.—The year's estimated timber-production from all sources is estimated to be 335,000,000 ft. board measure, an increase in round figures of 5,000,000 ft. board measure for the corresponding period last year. Although less timber was sold from State forests, the total cut from this source under all heads actually increased by 8,250,000 ft. as a result of working on reserves or areas purchased in previous years. Of the total reported cut of all rough-sawn timber, approximately 37 per cent. came from State forests.

Sawmills.—The recorded number of sawmills of all classes in the Dominion is 610, an increase of 12. Those working full time totalled 343, half-time 153, and closed down 114. It is interesting to note that 81 mills cut exotic timbers during the year and 294 worked full time cutting indigenous timbers. Only 142 mills were working in State forests.

Exports and Imports.—Schedules showing exports and imports of sawn timber and other forest produce, compiled by the Comptroller of Customs for the three years ending 31st December, 1937, 1938, and 1939, are published in Chapter IV of the report. Due to the conservation of white pine supplies for local essential uses, the exports of this timber have been reduced from almost 15,000,000 ft. board measure to only 2,000,000 ft. board measure, thus accounting for the total drop in the export trade from 27,000,000 ft. board measure to 15,000,000 ft. board measure. An expansion in the import trade is due solely to the increased demand for special-use timbers for which local substitutes are either unavailable or in restricted supply—principally Australian hardwoods and long-length Douglas fir.

Recreation.—The public continues to make increasing use of the State forests for recreational purposes, and the advent of the motor-car trailer and caravan induces larger numbers of townsfolk year by year to spend their annual holidays camping in forest glades or on roadsides in the precincts of the virgin bush. It is therefore very gratifying to record that the great majority of visitors were careful to light fires only in safe places and to do no damage to growing trees.

Those automobile patrolmen who act as honorary forest rangers rendered valuable help in supervision of camps and campers generally, and the Service desires gratefully to acknowledge the debt it owes for this co-operation.

Fire-prevention.—Information supplied daily by the Meteorological Office in relation to temperature, relative humidity and wind force recorded at various stations, and the weather changes which might be expected, was extremely useful during a long period of high fire hazard. It was possible again through the courtesy of the same Office and the National Broadcasting Service to broadcast warnings when fire danger existed in various parts of the Dominion, together with requests for particular care to prevent forest, scrub, or grass fires. Thanks are due also to Messrs. Bryant and May, Bell, and Co., Ltd., and Messrs. W. D. and H. O. Wills, Ltd., for their assistance in publicity work to stimulate the fire-consciousness of the general public.

Erosion.—The Service is keenly interested in the question of soil erosion and was represented on two Committees comprised of various members of Departments of the Public Service set up by the Government to consider and report on the whole problem.

General.—The activities of the Service continue to increase in volume and complexity, and the energies of all members of the staff were severely taxed to prevent work falling into arrears.

It should specially be mentioned that throughout the fire season, extending in most conservancies over several months, executive field officers experienced a particularly trying and anxious time, and for many weeks were virtually on continuous duty.

FOREST POLICY.

Forestry and Land Use Problem.

Forestry in New Zealand has arrived at a stage in its development when both the national problem and its solution have become obscured by a diversity of side issues and by failure to distinguish between objectives and methods of attack.

What is forestry? It is not alone the planting of trees; nor the production of timber; nor the provision of high-country grazing; nor the protection of watersheds; nor the preservation of wild life; nor the perpetuation of historic, æsthetic, scientific, and primeval values; nor the development of recreational uses. Neither is it the sum total of all these. It is something infinitely more, deriving its greatness not solely from the complex inter-relationship of its constituent parts, but from its basic contribution to the solution of the Dominion's general land-use problem.

In its simplest terms, the national land-use problem is that of so managing the entire land resource that its power to produce is at least preserved in perpetuity and augumented where possible. As will develop later in the discussion, this is a fundamental concept to which all social and economic principles must be made subservient. The contribution of forestry is twofold. By keeping in a state of maximum productivity its own non-agricultural lands forestry, through the maintenance of climatic equilibrium, regulation of stream flow, and control of erosion, preserves inviolate many factors on which agricultural lands depend for their productivity.

FEATURES OF KAURI FOREST MANAGEMENT.

[*Wm. C. Davies, Cawthron Institute, photo.*

PLATE 1.—ROADSIDE STRIPS ARE PRESERVED EXCEPT FOR REMOVALS IN THE INTEREST OF FIRE-PREVENTION AND TRAFFIC SAFETY.

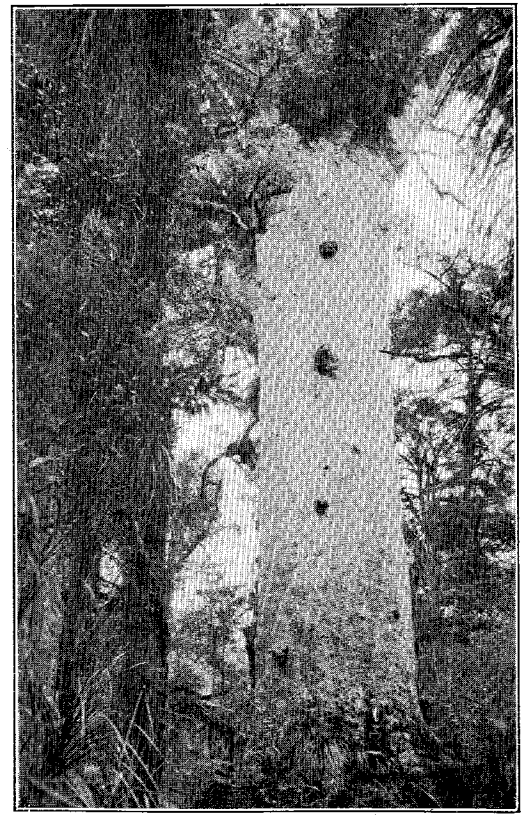
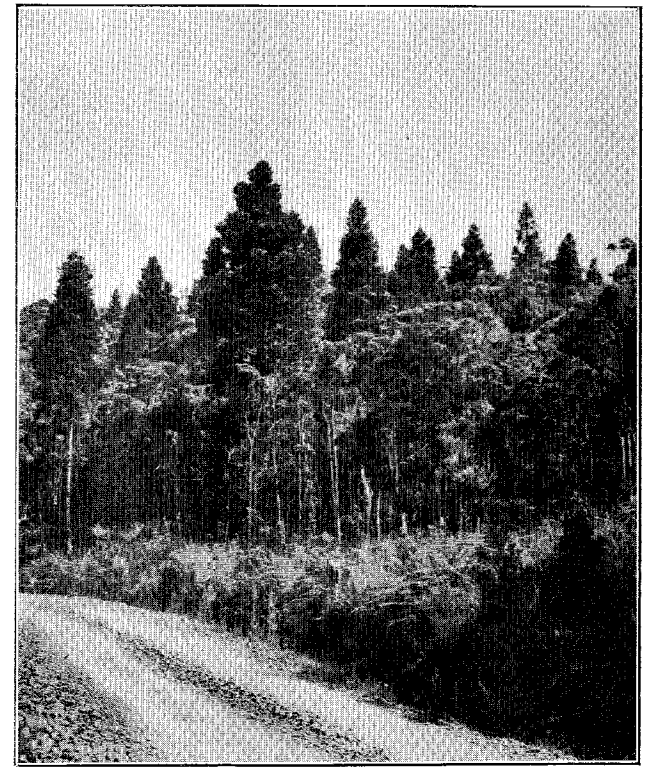


PLATE 2.—DISTINCTIVE TREES ARE PRESERVED AS NATIONAL MONUMENTS.



[*Wm. C. Davies, Cawthron Institute, photo.*

PLATE 3.—KAURI-FOREST MANAGEMENT IS NOT LIMITED TO MATURE FOREST, BUT EMBRACES THE PRESERVATION AND DEVELOPMENT OF REGENERATING AREAS.

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FEATURES OF KAURI FOREST MANAGEMENT.

[*Wm. C. Davies, Cawthron Institute, photo.*

PLATE 4.—CLUMPS REQUIRING THE REMOVAL OF MATURE TREES TO ASSIST THE DEVELOPMENT OF LARGE TREES FOR FUTURE PRODUCTION OF HEART TIMBER.

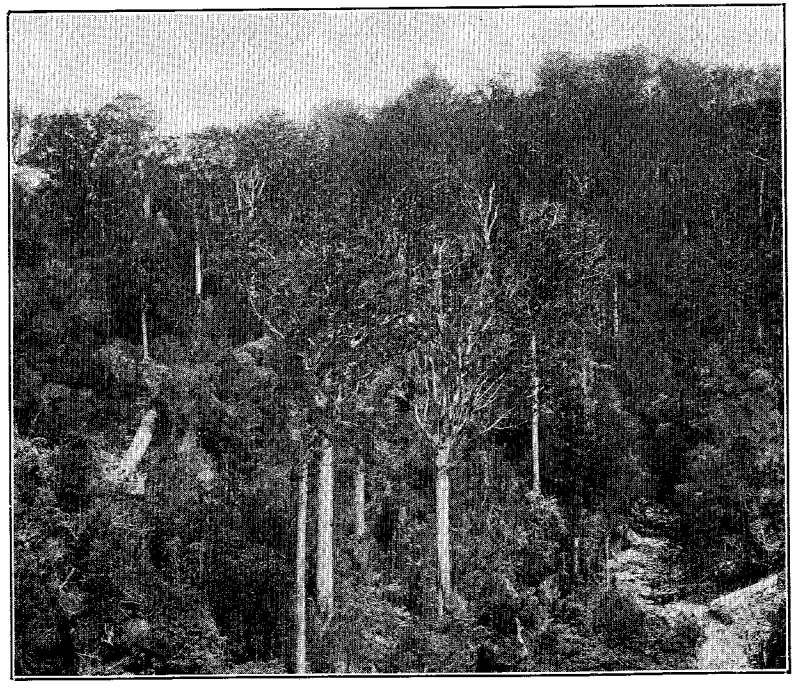

PLATE 5.—VIEW OF TYPICAL FOREST REQUIRING MANAGEMENT. STANDING DEAD TREES AND DECAYING LOGS IN FOREGROUND REQUIRE REMOVAL.

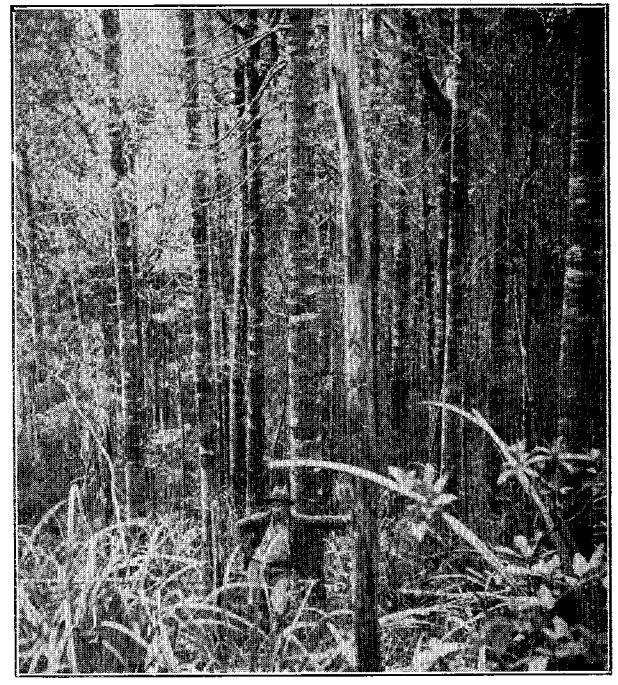

PLATE 6.—YOUNG AND ADVANCED GROWTH REQUIRING SILVICULTURAL TREATMENT.

Single-use versus Multiple-use Forestry.

To-day's side issues of forestry have been stated—from tree-planting and timber-production down the whole gamut of uses to scenic and recreational development. One and all they are a reflection of other days when villages had to have their grazing, the nobles their hunting, the iron-masters their charcoal, the glass furnaces and the salt "wiches" their fuel, and the king his navy. This was the single-use type of forest management which population pressure has long since replaced with multiple-use management. A few Royal parks and similar reserves of limited area are all that are left in most of the older civilized countries as a relic of those times. Virtually the whole of their forest lands are on a multiple-purpose basis. Only by putting the non-agricultural or forest lands to a multiplicity of uses can forestry be made of the greatest possible service to the community. Seldom is it possible to put individual forest areas to the entire range of uses. Often some uses conflict, but it is rare that a number cannot be harmonized and forests managed for the development of numerous social and economic values, provided, of course, that the fatal error of multiplicity of authorities over the same area is avoided.

Multiple-use management and unification of control must therefore be the essence of New Zealand forestry. Already it has been typified in the management of the kauri forests. Timber-production is taken care of by the preservation and tending of young and advanced growth, and by the ordered cutting of dead and dying trees; historic, scientific, and scenic interest by reservation of strips on frequented public roads and of individual trees or clumps of extraordinary size, beauty, or distinction in whatever part of the forests they may occur; and watershed-protection by the re-establishment of kauri on old cut-over forests. Silvicultural management and fire-protection are assisting to achieve all these (Plates Nos. 1–6). It is real forestry—the perpetuation of kauri forest as a living, healthy, productive, and reproductive community. Can the alternative of single-use mismanagement be seriously considered—the locking-up of the remaining kauri forest, without timber yield but with slow yet inevitable replacement of kauri by taraire and even more inferior species—all in the sole interests of historic and scenic values? It is confidently anticipated that the public would regard such a proposal as untenable.

At the same time the general policy of multiple-use is not rigidly pursued to the complete exclusion of single-use forestry. The State Forest Service has for many years made substantial additions to and assisted in the administration and protection of scenic reserves and national parks originally sponsored and still managed by the Department of Lands and Survey. The feeling of the public that a certain number of these single-use forests should be kept divorced from any ordinary forest areas on which other types of management may be imposed appears to be a very real one, doubtless a feeling of sanctity of purpose which might otherwise be violated.

Objective versus Methods.

The kauri controversy is typical of single-use side issues in forestry. Almost invariably they arise from confusion between objective and method. Organizations, no less than individuals, are most concerned regarding those broad facts directly touching their own interests, and ordinarily their major activity is the support of what appears to be the immediate remedy. Cause and effect not being properly related by those concerned, the apparently obvious remedy becomes the objective rather than the means to an end. It is bad enough that this should tend to develop a single-use-forestry complex, but what is even more regrettable is that it serves to obscure entirely the realities of the national problem and its solution. What of the planting of trees, if browsed by deer or burnt by fire or if the wood they produce be wastefully used? What of locking up high forests for watershed protection, whilst scrub areas elsewhere are being continually fired? The answer to these and to an infinite variety of similar questions is that the national objective is obscured by a haze of multitudinous remedies.

Yet of its very simplicity, the national forestry objective should stand forth unobscured and command the support of every section of the community. "By keeping in a state of maximum productivity its non-agricultural lands, forestry through the maintenance of climatic equilibrium, regulation of stream flow and

control of erosion, preserves inviolate many factors on which agricultural lands depend for their productivity." Is there any one section of the community which will not be benefited thereby? Not one. Is there a single individual? In the ultimate analysis there is not one. It is a simple objective—the maintenance of all non-agricultural or forestry lands in a state of maximum productivity. "Productivity" is employed, of course, in its widest sense to connote the fullest development of all uses and values reviewed as typical of single-use forestry. Add to this the not inconsiderable social and cultural benefits which accrue to any community with a well-balanced agricultural, forestry, and industrial economy, and the objective is one which should command the support of the whole country.

The Realities of Forestry.

If the national problem is easily defined, its solution is no less an involved and difficult one.

In its initial phase all forest (or non-agricultural) lands are not under public ownership or even under a public tenure which permits of adequate management by the State. The graph of State forest proclamations which follows shows that State forests have since the inception of the Service increased from 4,959,674 acres to 8,354,861 acres. With the aid of the Department of Lands and Survey, it will continue to increase. As rapidly as the administrative machinery allows, areas are demarcated, forest lands proclaimed as State forests, and farming lands as settlement

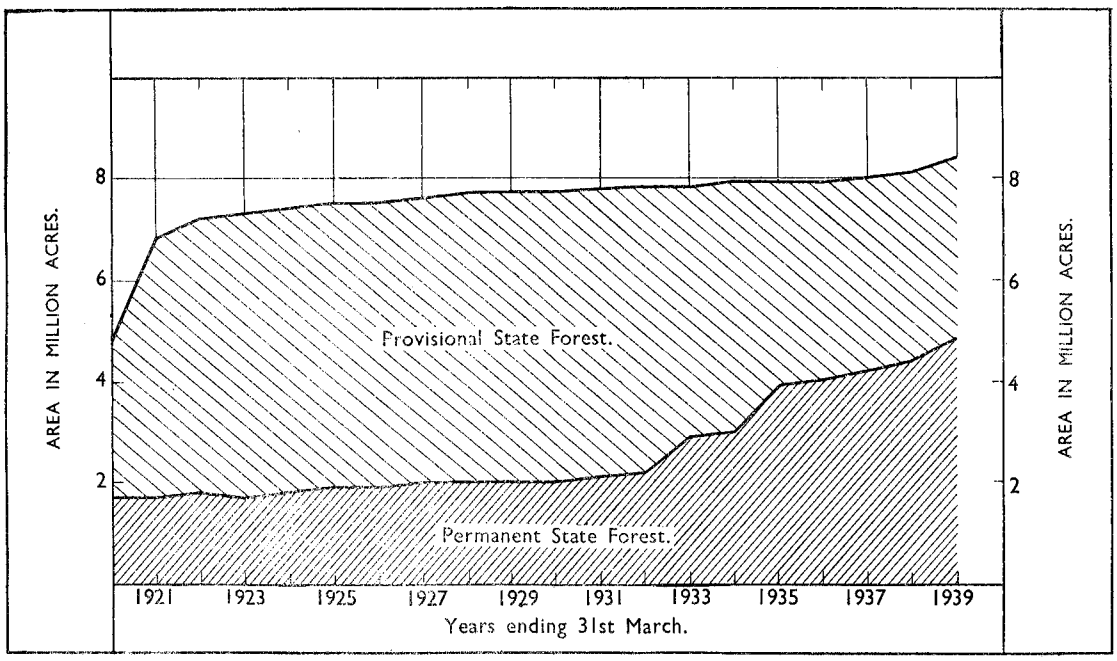

Fig. 1.—Progress of Reservation of Permanent and Provisional State Forests, 1920 to 1939.

areas, but there is, in addition, at least another 7,500,000 acres of forested or forest land requiring management. A great part of this area is under freehold or equivalent tenure. In this respect New Zealand experience parallels that of many of the older forest-practising countries of Europe, and it is significant that there, either because of timber shortages or of excessive erosion and flooding at some stage in their history, one and all have been compelled to exercise some measure of sovereignty over private forest lands before deterioration reaches the stage which is characterized first by tax-delinquency, and finally by complete abandonment of derelict and useless land.

Fire-control.

The social obligations inherent in all land use require some measure of immediate recognition if vital interests of the community are to be adequately safeguarded. The paramount obligation is avoidance and control of fire. Not merely the control of fire because of the direct loss arising out of the destruction of merchantable trees and insurable property, but, because of the infinitely greater indirect national loss,

some measure of control of burning as a farming practice. The difficulties inherent in any such extension of fire-control even over limited areas are fully realized, but it is difficult to believe that the farming community will not in its own interests welcome such a reform as the only practicable and physical solution to the problem of stream regulation and erosion control. Admittedly, overgrazing, deer, and other factors do contribute in some measure to forest devastation, and to erosion, &c., but fire is the paramount agency of destruction, and its control the major reality of forestry and general land use.

Let the public judge for itself. There is hardly a district in New Zealand where this fact is not self evident. Visit North Auckland, Coromandel, Bay of Plenty, Marlborough, Canterbury, everywhere scarred hillsides give mute testimony. Silted harbours and rivers, costly road, rail, and river works add their tale. Still year after year the fires continue, until the degradation of the vegetation cover becomes complete, the soil disappears, and the rocks make their appearance. Must this continue? Or will the public insist that private owners and occupiers recognize the social obligations inherent in the use of land? If so, the nude hills of to-day will be reclothed afresh in productive forests, streams better regulated, and erosion minimized. Both directly and indirectly there will be a national gain and the land as an asset improved rather than despoiled.

How to control fire is a national problem in itself—legally, administratively, and practically. Nothing in recent years has demonstrated this so effectively as did the Victorian disaster of January, 1939, and New Zealand is endeavouring to benefit by this experience in co-ordinating and improving fire-control and fire-fighting activities of all Government and private agencies. But, of necessity, this must be directed immediately to the major objectives of safeguarding life in potentially dangerous areas and of providing maximum protection to the most highly valuable forests.

The legal and administrative aspects are of no less importance and are being given that close study which they merit. Administratively, the basic weakness under existing legislation, &c., is that the onus of proof rests upon the prosecuting authority. As a legal principle the presumption of innocence of accused persons may be, in the words of the learned Judge who, as Royal Commissioner, investigated the disaster mentioned, "one of the ornaments of British law," but because it has been the fundamental protection of indiscriminate burners it is in fact an ornament to land-devastation in every country colonized by English-speaking peoples. It may at first sight appear too drastic to suggest that the position should be reversed and the onus of proof thrown upon the accused, but the possibility appears to be dictated by the basic necessity of holding inviolate the power of the land to produce. It is this fundamental concept which is violated by existing practices and enactments.

The learned Judge already referred to has suggested that a doctrine analogous to that of "recent possession" might be imported. While this does not place any onus on the accused, in the words of the Royal Commissioner, it—

> "enables but does not oblige the Court to draw an inference of guilt in the absence of an account (of his possession of goods recently stolen) which may reasonably be true and consistent with innocence. If the account which the accused in the case of prosecution for lighting a fire, might give in respect of his suspected connection with such lighting were such that it might reasonably be true and were consistent with innocence he would be entitled to acquittal. The justification for the importation of such a doctrine would be, as it is in the case of stolen goods, that it is highly improbable that the commission of the offence can ever be proved by the evidence of eye-witnesses. In Victoria the lighting of fire illegally is done furtively, and can seldom be proved except by proof of a confession of guilt made by the accused when interrogated before a prosecution is instituted. The necessity of obtaining a confession is, in all cases, highly undesirable and often leads to the employment of methods which, when

> revealed, destroy the value of the evidence alleged to have been obtained. It is well known that fires are lit on the property of land-holders by others who are actuated by spite. A country Magistrate would be well aware of this possibility and would consider it in any proceedings before him."

This and other doctrines should be fully investigated before resorting to the more drastic alternative already discussed. Likewise, the State Forest Service policy of fire-control propaganda and education must be persevered with, but it is respectfully submitted that the subject of fire-control should command from every section of the community an intensive study commensurate with its scope and far-reaching importance.

All legislation being permissive, it may be necessary for the time being to be satisfied with an improvement in the practical aspects of fire control and protection, but there appears to be little doubt that some authority will be required to close down all burning operations, whether in bush haulers, locomotives, or sawmills, during periods of abnormally high fire hazard. There has always been a tendency in New Zealand to decry the possibility of the so-called green rain forest burning readily, but since the bad fire in the Tongariro National Park district two years ago investigations have shown that for short periods, of several days at the most, extremely dangerous conflagration conditions may develop, and to prevent a recurrence of any fire of the proportions of the Raetihi disaster in 1918 recommendations will probably be brought down for a complete "black-out" of all fires in any district named by radio broadcast. Voluntary co-operation in this direction has already been effected with the sawmillers' national organization; and on the first occasion that a radio broadcast was used it was of startling significance to find that the only forest fires which did occur on that particular date were located in those areas for which the radio warning was broadcast.

Forest Management.

The maintenance of forest lands in a state of maximum productivity applies equally as well to the growing of timber as to the wider uses previously discussed, but the condition of the indigenous forests leaves much to be desired in this respect. By far the greater part comprising the rain forests stretching between Auckland in the North Island and Westport in the South Island and those of Southland-Otago are in a mature or even decadent condition, consisting typically of a few large trees per acre with little regeneration and with any new growth offset by decay. The forests in which regeneration is relatively plentiful and net growth appreciable are strictly limited, the principal types being kauri and beech in numerous favourable localities, and possibly rimu in the Westland district of the South Island.

Reference has already been made to the national importance of managing on a multiple-purpose basis the whole of the kauri forests. By virtue of their much larger area and greater productivity it is of even greater importance to manage similarly the whole of the rimu-pole-type forests of South Westland (Plates Nos. 7–10). From Ross northwards there is, amongst the remaining patches of bush, the usual picture of forest devastation—a wilderness of unsightly snags, blackened stumps, and noxious weeds, the usual results of fire following logging. As the remaining bush is so treated and the timber exhausted in North Westland, is this practice to continue southward? It is believed that Westland, no less than the rest of New Zealand, desires to avoid this.

Here is the real challenge to forestry in New Zealand. South of Ross there is, except for a relatively few areas, a stretch of State forest land carrying the finest stand of young rimu that exists or probably has existed for many centuries in New Zealand. Similar stands have already been exploited, using the word advisedly, in North Westland. About fifty medium-sized trees have been used from each acre, but one hundred or more young trees up to 10 in. in diameter, representing over a century of growth, have been razed to the ground. Even a cursory examination of the photographs appearing in this report must arouse grave doubts in the minds of the public as to the protection of its assets and to the discharge

RIMU FOREST MANAGEMENT, WESTLAND.

What to avoid.

PLATE 7.—HIGH LEAD LOGGING IN COASTAL POLE-TYPE RIMU STANDS.

To secure relatively few trees many hundreds of young trees have been razed to the ground, leaving devastation and high fire hazard.

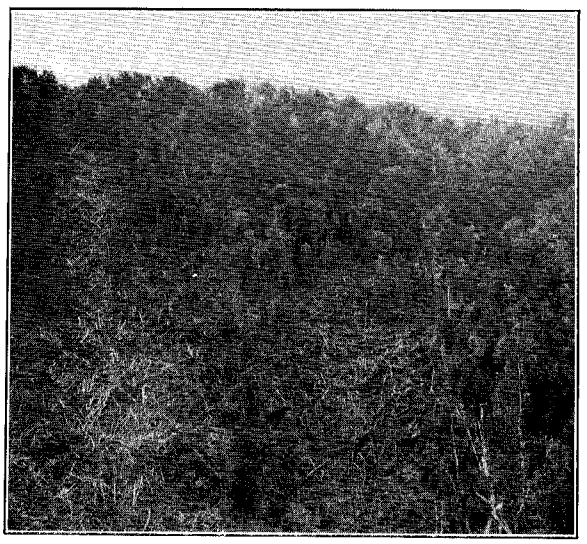

PLATE 8.—HIGH LEAD LOGGING IN RIMU-KAMAHI STANDS.

The fire hazard has been very greatly increased and the protective value of the remaining forest diminished.

What to perpetuate.

PLATE 9.—GENERAL VIEW OF TYPICAL COASTAL RIMU-POLE TYPE.

Rimu stand from which millable logs may be procured at thirty year or other intervals by selective logging.

PLATE 10.—CLOSE UP OF RIMU-POLE TYPE FOREST, SHOWING SOME LARGER TREES TO BE REMOVED BY SELECTIVE LOGGING.

[*To face page 6.*

of the Forest Service stewardship if such practices are to be perpetuated. The sawmiller is not to blame, nor the district, only the administration. The economic wastage of young growth is sufficiently serious in itself. The contrast between a healthy productive stand and a stark wilderness of felled timber is startling—even the layman can appreciate the fire risk and the opportunities for eroding agencies. For these reasons high lead logging is being severely discouraged, and on new areas will be disallowed except under special circumstances.

Is North Westland to be duplicated? Is one crop of timber to be taken without regard to the future? Is subsequent burning, grazing, and mining to be allowed to develop another unsightly countryside, largely unproductive? Picture the alternative—an evergreen forest stretching in wide swathes to the Southern Fiords—selective logging in place of clearcutting, taking out the larger trees and preserving the younger until thirty years or so later they yield another crop—and so on, it is hoped, *ad infinitum*. Between the forests and the more fertile lands agriculture may then prosper. This again is real forestry—the most promising example of sustained yield management in New Zealand. At the outset the cost of producing logs may be somewhat greater, due to the greater care required in logging and possibly the greater area to be covered in securing current requirements, but any immediate sacrifice will ultimately be repaid manifold. To Westland itself it means permanent prosperity. Here, as in no other place in the Dominion, timber cropping may be immediately substituted for timber mining.

While the kauri forests of Auckland and the rimu-pole-type forests of South Westland are of outstanding importance because of immediately promising results, the rain forests of the mid-Islands districts and the beech forests throughout the Dominion must command increasing attention. Hitherto they have been deemed as worthy of only academic interest. The apparent impossibility of managing them economically—*i.e.*, on any basis of compound interest at current rates—has placed them in an altogether false perspective. It is indeed doubtful if any forest has ever been so managed on short-term rates. Actually the economic aspects are of little significance until the silvicultural and management aspects are fully understood, an achievement which can be attained only by experiment and research. To implement this a demonstration forest has been established in the rain-type forests at Te Whaiti midway between Rotorua and Waikaremoana, whilst a search is being made for similar forests in the beech areas of the Central Plateau of the North Island and of the Nelson and Southland regions. What is not economic this year of grace, 1939, may, under population pressure, be economic in 2139, and upon these demonstration or experimental forests New-Zealanders of that period will be dependent for the proper management of their indigenous forest resources. If only such forests had been established one hundred years ago, how much better equipped would New Zealand be to manage its forests henceforth. The demonstration forests are a very necessary contribution to posterity.

Essentially these experimental forests are for the perpetuation of the indigenous forest resource, since this is the only practicable measure of achieving the national objective in its fullest sense. Whether or not the indigenous forests will eventually of themselves provide the whole or the greatest part of the country's timber requirements the future alone can decide. For a considerable period they cannot, due to the long time required to convert the mature forests into healthy productive stands. Even the physical possibility of this conversion has been questioned. Authorities who cannot be ignored have regarded the indigenous stands as a decadent forest in respect to the commercial timber species. They see, in effect, the meeting in New Zealand, as the last exposed land remnant of a sunken continent, of the vestigial traces of three great primeval forest or botanical associations, one of sub-tropical origin, one of sub-antarctic, and the other of the land mass itself. While the available evidence clearly supports this view, their view that the present commercial timber species are doomed to natural slow replacement by other species offers no bar to an attempt to arrest this succession at the pre-climax stage, thus endeavouring to perpetuate the present industrially useful species. Still, in order to safeguard the general policy of managing the

indigenous resources for timber production, it has been deemed necessary to institute, in addition, experimental underplanting and interplanting of the indigenous forests and cut-over lands with timber-producing exotics. It is no less an essential activity than the experimental indigenous forests themselves.

Utilization.

It is a truism that the forests are unable to contribute their full share to the welfare of the country unless the wood they produce is fully and economically utilized. New Zealand has long passed the time since its indigenous forests grew more wood than the country required, and the necessity for efficiency in harvesting and conversion is therefore the greater. What of the future? It is not impossible that the exotic forest capital resource now being established will yield a surplus over the country's demands, even allowing that the supplies of virgin indigenous timber will be rigidly economized. Such a possibility calls for a twofold study of national significance—one, economic, covering basic industrial and transport factors, and the other, research, covering the scientific utilization of the entire range of wood products ranging from fuel to cellulose derivatives. Their economical production in order to compete in the world's market is the objective which is now being pursued.

Taken at their face value, the difficulties appear insuperable. High wages, heavy transport costs, excessive chemical costs, onerous power-costs, badly-spaced trees, poor-shaped logs, knotty timber, high forest investments, expensive maintenance—these are but a few of the difficulties hindering the development of overseas markets. But if no local protected market is available, must the surplus be left to decay? Or is there a residual value to all concerned? This is one of the numerous questions which it is hoped to answer.

CHAPTER I.—MANAGEMENT.

1. Areas under Control.

The total area of forests controlled by the State Forest Service is now 8,354,861 acres, as against 8,122,690 at the end of the year 1937–38, an increase of slightly less than 250,000 acres. Actually the year's proclamations in terms of the Forests Act aggregated 259,825 acres, but during the same period 26,675 acres were withdrawn from reservation. The dedication of bush-clad Crown lands as State forests is steadily proceeding as from time to time new tracts of country are examined and classified as unsuitable for farming purposes.

Table 1.—Schedule of Areas of State Forests as at 31st March, 1939.

Forest-conservation Region.	Permanent State Forests.		Provisional State Forests.		Totals.	Percentage of Total Area of Region under Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	
Auckland ..	372,042	82,430	121,147	14,006	589,625	6·86
Rotorua ..	443,945	246,216	133,073	77,039	900,273	17·91
Wellington ..	1,064,162	65,891	31,523	7,649	1,169,225	7·81
Nelson ..	581,603	121,615	982,725	629,493	2,315,436	33·04
Westland ..	621,183	163,304	500,999	423,882	1,709,368	44·24
Canterbury ..	433,046	3,647	..	..	436,693	4·39
Southland ..	529,101	56,234	635,166	13,740	1,234,241	7·27
	4,045,082	739,337	2,404,633	1,165,809	..	..
Totals ..	4,784,419		3,570,442		8,354,861	12·58

Table 2, which follows, shows the distribution by forest-conservation regions of the new areas proclaimed. The major proclamations affected Rotorua, Wellington, and Nelson, and comprised mainly forest high country valuable for protection purposes.

TABLE 2.—SUMMARY OF AREAS ADDED TO PERMANENT AND PROVISIONAL STATE FORESTS, 1ST APRIL, 1938, TO 31ST MARCH, 1939.

Forest-conservation Region.	Permanent State Forests.		Provisional State Forests.		Totals.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.	
	Acres.	Acres.	Acres.	Acres.	Acres.
Auckland	12,346	784	4,881	..	18,011
Rotorua	79,126	6,172	..	..	85,298
Wellington	82,966	..	..	..	82,966
Nelson	56,259	..	525	1,622	58,406
Westland	1	..	122	822	945
Canterbury ..	5,844	..	..	..	5,844
Southland	5,799	460	2,096	..	8,355
Totals ..	242,341	7,416	7,624	2,444	259,825

Table 3 shows the areas withdrawn from forest reservation, and the reasons therefor. The largest area—17,985 acres—was included in Arthur Pass National Park.

TABLE 3.—SUMMARY OF AREAS WITHDRAWN FROM PERMANENT AND PROVISIONAL STATE FORESTS, 1ST APRIL, 1938, TO 31ST MARCH, 1939.

Forest-conservation Region.	For Settlement Purposes.		For Scenic Reserves.		For Stock Reserves.	For School Reserves.	For National Park.	Totals.
	Permanent State Forest.	Provisional State Forest.	Permanent State Forest.	Provisional State Forest.	Permanent State Forest.	Permanent State Forest.	Provisional State Forest.	
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Auckland ..	565	845	..	382	9	..	..	1,801
Rotorua ..	18	3,954	..	..	..	13	..	3,985
Wellington ..	32	..	..	..	..	..	..	32
Nelson	511	..	..	..	..	..	..	511
Westland ..	..	834	13	..	..	..	17,985	18,832
Canterbury ..	..	..	..	..	6	..	..	6
Southland ..	..	402	214	892	..	..	..	1,508
Totals ..	1,126	6,035	227	1,274	15	13	17,985	26,675

It may here be recalled that, pursuant to section 34 of the War Legislation and Statute Law Amendment Act, 1918, and subsequent legislation, many large tracts of forested country were proclaimed provisional State forests with a view to the proper utilization of the milling-timber under the supervision of the Forest Service, the subsequent return of control to the Lands and Survey Department of such areas as were deemed suitable for settlement, and the reservation of the remainder as permanent State forests.

Since then many thousands of acres have been added to the permanent forest estate—the total last year being 152,891, of which 73,840 acres, mainly high mountainous country, will be conserved for protection forest and 63,856 acres in Catlins River district, Otago, placed under forest management. The impressive record of permanent State forest proclamations listed in Table 4 speaks for itself.

TABLE 4.

Year.	Permanent State Forest.	Provisional State Forest.	Total State Forest.
	Acres.	Acres.	Acres.
1920	1,666,302	3,293,372	4,959,674
1921	1,668,319	5,134,651	6,802,970
1922	1,777,169	5,404,806	7,181,975
1923	1,716,544	5,619,466	7,336,010
1924	1,771,351	5,661,830	7,433,181
1925	1,854,922	5,630,668	7,485,590
1926	1,866,990	5,686,700	7,553,690
1927	1,957,483	5,699,361	7,656,844
1928	2,044,142	5,664,347	7,708,489
1929	2,064,514	5,679,936	7,744,450
1930	2,036,247	5,663,004	7,699,251
1931	2,126,837	5,634,329	7,761,166
1932	2,196,033	5,632,090	7,828,123
1933	2,920,006	4,921,432	7,841,438
1934	3,025,789	4,855,785	7,881,574
1935	3,872,456	4,015,829	7,888,285
1936	4,043,693	3,866,479	7,910,172
1937	4,193,139	3,762,250	7,955,389
1938	4,383,249	3,739,441	8,122,690
1939	4,784,419	3,570,442	8,354,861

2. PROTECTION FORESTS.

The task of building up a permanent forest estate received a further fillip by the addition during the year of nearly 250,000 acres of rugged mountainous country, mainly bush clad, except where—*e.g.*, Nelson Region—there are open tops above the bush-line. More than half the total area mentioned lies along the main divide in the hinterland of the North Island. In it several rivers and streams have their source, there are numerous stands of good beech timber, and for forest-protection purposes it is regarded as an extremely valuable acquisition. The other major area is in Nelson Region, and, as already mentioned, comprises high country with scattered bush and open mountain tops.

A smaller area of beech forest in Catlins district, Southland Region, was also permanently reserved. This carries stands of beech with good regeneration, and it is hoped will prove suitable to be treated as a managed forest.

Without the enthusiastic and valuable co-operation of the Department of Lands and Survey the control of many protection-forest areas would not have been transferred to this Service, and that Department's ever ready assistance in this connection is gratefully acknowledged. A case in point is the withdrawal from further grazing of several high-country pastoral runs in order that they can be placed under permanent forest reservation.

It has been many times emphasized in previous reports that the most serious enemies which menace the very existence of our indigenous forests, in particular, are fire and noxious grazing animals. The first will be dealt with in detail in another portion of this report, so will not be further discussed here save to say that with the recent Australian forest-fire catastrophes fresh in mind the general public of this Dominion should require no warning " to be careful with fire."

With respect to the depredations of deer, goats, thar, wapiti, &c., it is manifestly impossible to expect that, after being acclimatized and left comparatively unmolested for many years, these forest pests can ever be completely exterminated, but it is certain that the present systematic Dominion-wide campaign against deer now being carried on under the direction of the Department of Internal Affairs must have a very wholesome effect by greatly reducing the herds and so preventing to a considerable extent the great forest damage caused by the feeding and other habits of these animals.

UNCONTROLLED CLEARING AND BURNING—THE ARCH MENACE OF INTELLIGENT FOREST AND LAND USE.

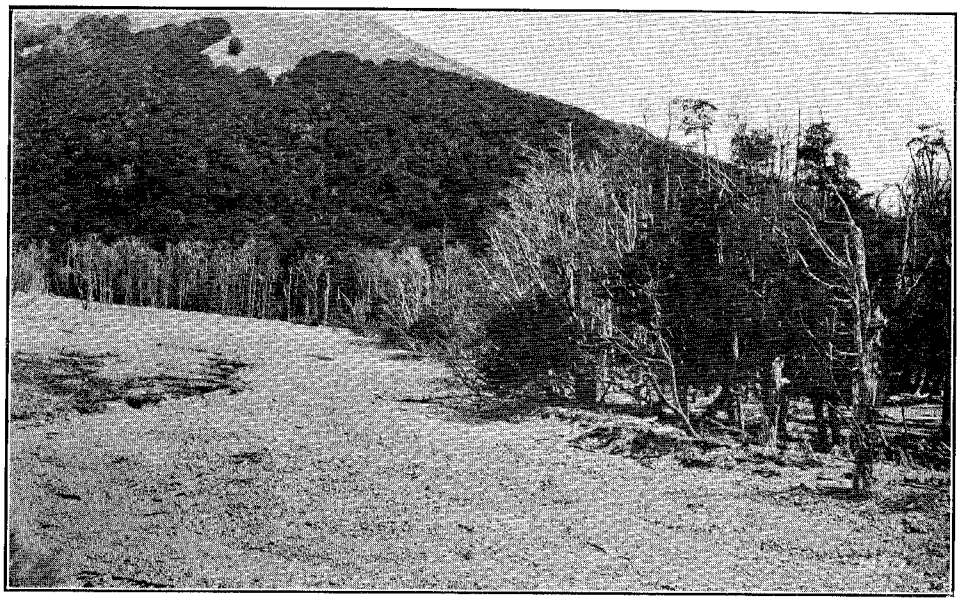

PLATE 11.—TREES KILLED BY SCREE MATERIAL RELEASED THROUGH THE DENUDATION OF UPLAND GRASSLANDS BY UNCONTROLLED BURNING.

THE CONTRAST.

Two sides of the same Valley.

(Plates 12 and 13.)

PLATE 12.—SOIL-PROTECTIVE VALUE OF BUSH MAINTAINED AND PRODUCTIVITY INCREASED BY FIRE-PROTECTION MEASURES.

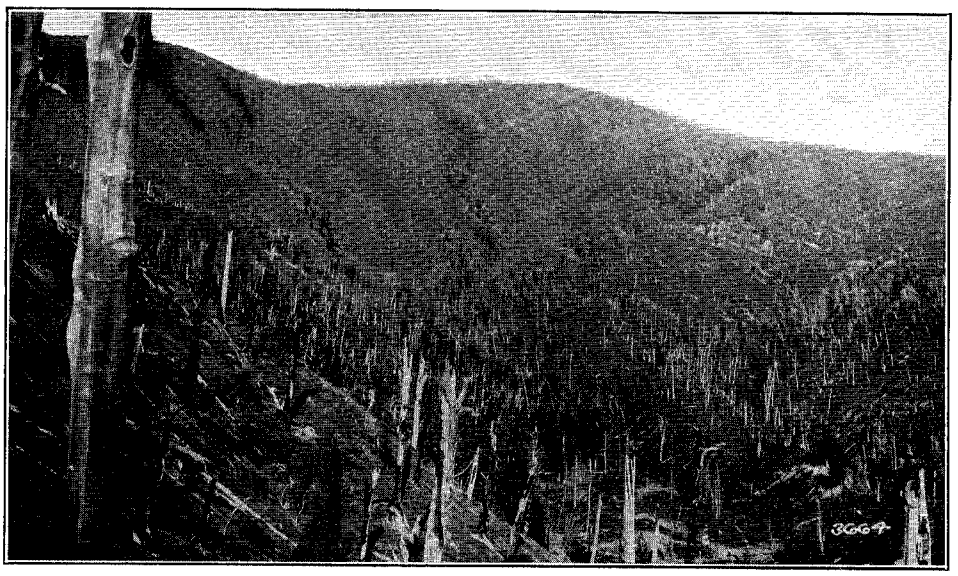

PLATE 13.—BURNT BUSH COUNTRY SHOWING EROSION APPEARING AS THE RESULT OF FOREST DENUDATION.

[*To face page 10.*

3. Forest Reconnaissance, Demarcation, and Timber Cruising.

In Auckland Conservancy the main reconnaissance work was the continuation of the surveys of Puketi and Waipoua State Forests. At the former station field-work was pushed forward to enable it to be completed if possible before winter sets in. A field party completed the survey of an area of 12,000 acres and 119 chains of boundary-lines were located. The formation of an access and extraction road was put in hand, and at the close of the year 125 chains had been formed, 74 chains metalled, three bridges (one 180 ft. long), and seven culverts constructed, seven miles of new riding tracks were formed, and about thirty miles of old tracks reconditioned.

Survey-work is proceeding at Waipoua, and the timber-measuring and type-mapping of 1,300 acres in Block III (topographically surveyed the previous year) was completed. A start was made with the topographical survey of the kauri-bearing portion of Block II, 500 chains of grid-lines being cut. A commencement was also made with the topographical survey of Warawara State Forest, and, although some preliminary work was done, it was hampered owing to shortage of trained staff.

At Omahuta the reconditioning and metalling of the access road were completed, 4,350 yards of metal being used.

In Rotorua Conservancy a reconnaissance survey was made of an area of 355 acres of silver beech, as there is a local demand for this species for motor-body work, and, although the result showed a volume of only 4,150 ft. board measure per acre and the timber tends to be much denser than the Southland silver beech, it is hoped that the area may prove millable.

In Wellington Conservancy the field staff was fully occupied with the cruising of new timber areas in response to applications from established sawmillers, and thirteen cruises, covering approximately 9,000,000 ft. board measure, valued at over £14,000, were completed, in addition to others which were made at the request of the Native Department. Three inspections were also made on behalf of the Tongariro National Park Board.

In Westland Conservancy the field-work obtained in the final quarter of the preceding year was plotted and other office work completed relating to the reconnaissance surveys at Saltwater, Karangarua, and Bruce Bay. These covered a total area of 6,479 acres, with a recorded stand of 83,760,000 ft. of timber.

In Southland a reconnaissance survey of 1,227 acres in Lilburn district revealed a stand of approximately 14,346,000 ft. of mixed species; 2,600 acres of milling timber in State forests in twenty-five lots were cruised for sale purposes, the total stand being 22,410,000 ft. board measure.

In addition to its ordinary duties of measuring and appraising blocks of timber to meet the requirements of sawmillers, the Service continued to cruise blocks of timber at the request of the Lands and Survey and Native Departments, and, in a few instances, private concerns also. Particulars of these are shown in the schedule below.

Table 5.—Timber Appraisals for Government Departments, etc.

Region.	Number of Jobs.	Area cruised.	Quantity of Timber.
		Acres.	ft. b.m.
Auckland	4	1,059	8,400,000
Rotorua	5	1,383	13,000,000
Wellington	3	1,445	10,637,000
Nelson	20	1,400	Output basis.
Westland	10	1,108	3,600,000
Canterbury	1	..	50,000 30 cords.
Southland	9	910	6,216,000
Totals	52	7,305	41,903,000

4. State Afforestation.

Very little planting of new areas was done during the year under review, the principal ones in the North Island being 640 acres as an addition to Tairua Plantation (Auckland Region), and two blocks of 619 acres and 644 acres respectively cut-over land underplanted in the northern part of the Wellington Conservancy. In the South Island a small area of 368 acres was added to Golden Downs Plantation.

The North Auckland project comprises about 8,900 acres lying along the east coast in the vicinity of Mangonui. Planting cannot be commenced this season as the establishment of a tree nursery—a necessary preliminary step—is not yet complete.

The South Island project, now known as Ashley State Forest, has an area of 4,749 acres and is located close to the town of Rangiora, North Canterbury. A topographical survey of the block was undertaken towards the close of the year, and at the end of that period 2,500 acres had been surveyed. A temporary camp has been established, and it is expected that 500 acres will be planted during the coming season.

Table 6 gives a statistical summary of afforestation operations at the close of the year; additional afforestation activities were blanking 2,784 acres, replanting 3,312 acres, and interplanting 155 acres. It will be observed that the total planted area at that date was 430,742 acres.

Table 6.—Summary of Operations in Plantations as at 31st March, 1939.

Plantation.	Year of Commencement	New Area planted, 1938.	Total Net Area planted.	Gross Area of Plantation.
		Acres.	Acres.	Acres.
Mangonui	*	..	..	8,927
Waipoua	1925	60	1,616	12,600
Puhipuhi	1904	..	1,176	1,558
Riverhead	1926	15	11,078	11,956
Maramarua	1928	8	12,311	14,087
Tairua	1930	640	11,785	48,510
Rotoehu	1937	67	303	30,402
Whakarewarewa	1898	..	8,033	10,065
Waiotapu	1901	..	7,051	7,974
Kaingaroa	1913	107	259,147	328,667
Tongariro	1937	619	696	1,800
Erua	1930	644	3,760	6,648
Karioi	1927	..	17,196	33,689
Golden Downs	1927	368	19,679	24,174
Westland	1922	..	3,064	5,839
Hanmer	1901	..	7,784	10,372
Balmoral	1916	23	21,242	24,041
Eyrewell	1928	..	18,343	19,266
Ashley	*	..	..	4,749
Naseby	1900	18	3,098	4,032
Dusky	1898	..	4,470	6,866
Conical Hills	1903	..	3,612	3,906
Pukerau	1915	..	565	628
Blue Mountains	1925	8	8,822	9,708
Pebbly Hills	1930	..	4,329	5,330
Minor areas	1875–1937	134	1,582	8,758
Totals	..	2,711	430,742	644,552

* New project.

5. Sales of Timber.

With the exception of three conservancies—Auckland, Rotorua, and Southland—timber sales showed a slight reduction in comparison with last year's figures. In Westland the reduction was 13,200,000 ft. board measure, and in Wellington and Nelson 137,000 and 1,586,000 respectively. Notwithstanding this, however, the total volume of sawn timber cut from State forests (Warden's areas included) increased over the same period by 8,250,000 ft. board measure, the figures being 121,250,000 ft., against 113,000,000 ft. for 1937–38.

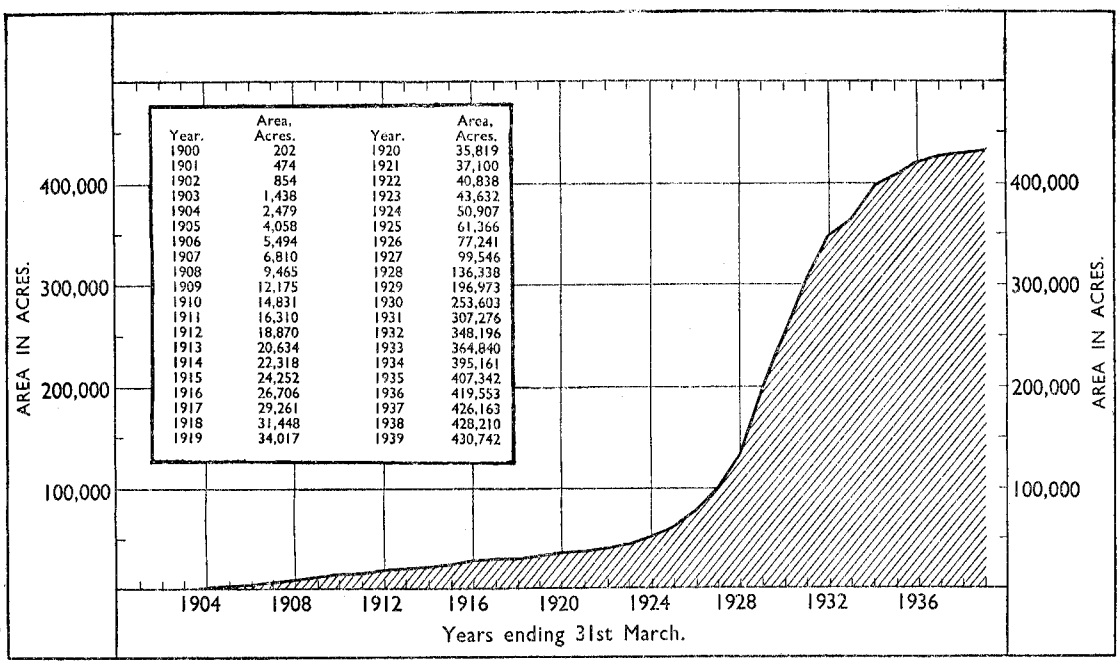

FIG. 2.—STATE EXOTIC FORESTS: TOTAL PLANTED AREA.

TABLE 7.

Year.	Number of Sales.	Quantity sold.	Sale Price.
		Board Feet.	£
1934–35	117	65,302,700	71,243
1935–36	130	102,219,800	131,447
1936–37	146	107,429,600	124,522
1937–38	140	103,341,450	107,866
1938–39	119	90,292,600	104,821

The demand for fencing-material, sleepers, poles, house blocks, &c., still remains keen, and it was difficult to satisfy the requirements of applicants for splitting areas, particularly in Westland and Wellington Conservancies. For example, in Westland alone 78,251 silver-pine posts and stakes, 3,295 strainers, 3,510 stays, and 8,023 poles, all of the same species, were extracted from State forests. When to this are added house blocks, sleepers, &c., the total volume so obtained exceeds 100,000 cubic feet.

In Wellington much the same position prevailed, the predominating species being silver-pine, red beech, totara, kawaka, and rimu; posts and strainers numbered 89,770, house blocks 16,790, poles 3,802, firewood 921 cords, while stakes, battens, laths, &c., totalled approximately 157,000; the royalty value of this produce was £2,520, a gross increase of £420 on the figures for the previous year.

The total production of rough-sawn timber from all sources has also risen and is estimated at 335,000,000 ft., nearly one-fourth of which was milled in the Westland Conservancy, where it may be mentioned last year's cut of 74,114,300 ft. board measure has only twice been exceeded since the inception of the Service. The percentage cut from State forests and Warden's areas was nearly 37 per cent. of the total production.

6. SALES OF LOGS.

Mention was made in last year's report that "the substitution, wherever possible, of log sales for block disposal of standing timber" was one feature of the proposed five-year plan of forest works, and that steps would be taken as soon as possible to give effect to this radical change in sales policy by an experimental demonstration project in the Te Whaiti district, Rotorua Conservancy. The immediate objective in placing this State forest under silvicultural management is to experiment with various cutting systems whereby re-establishment of the

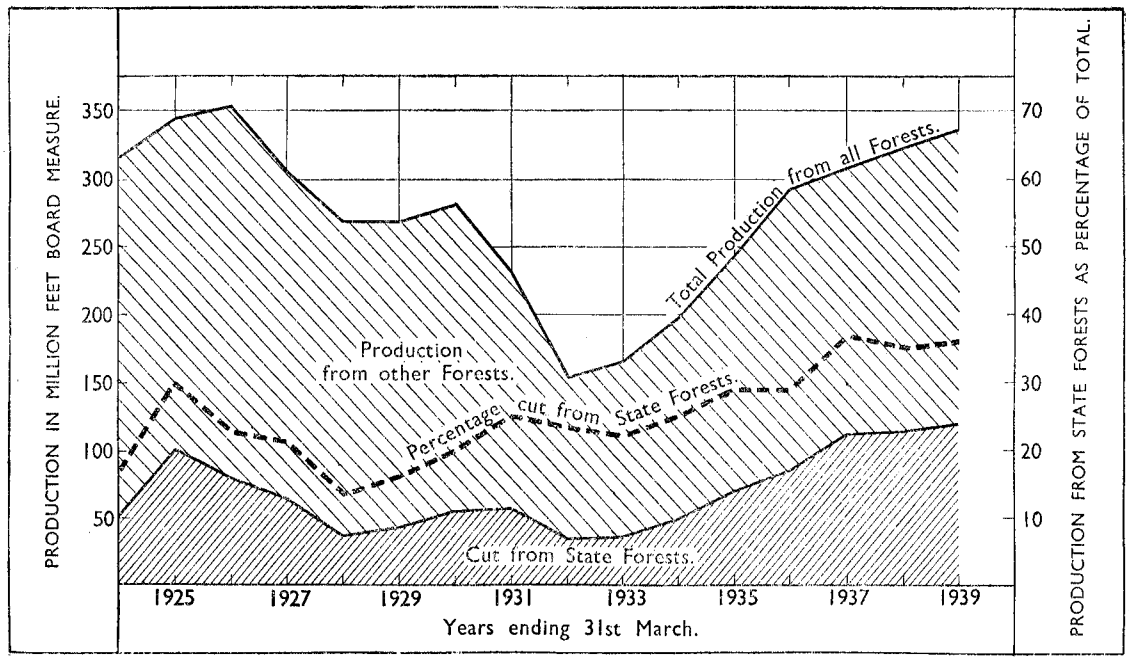

FIG. 3.—ROUGH-SAWN TIMBER: TOTAL REPORTED PRODUCTION AND CUT FROM STATE FORESTS, 1924 TO 1939.

commercial species will be achieved. Ultimately some measure of sustained yield may prove possible and tractor-arch logging has been selected as the most promising medium of exploitation, minimizing as it will the danger to the remaining stand.

To this end the first contract for the sale of indigenous forest logs was entered into in September, 1938, with a local sawmilling company. The total forest area is approximately 12,000 acres, and for the seven months ending 31st March last 1,669 trees, mainly kahikatea, rimu, and matai, with a sprinkling of miro and totara, containing a total volume of 418,563 cubic feet, were felled and delivered at the sawmill. The logging is done by modern 90 h.p. Diesel caterpillar tractor and arch equipment (*vide* photograph), and is not only the most modern but also the only one so far successfully demonstrated in the Dominion. Known as the Whirinaki logging project, the inaugural experiment is located about fifty-five miles from Rotorua in the basin of the Whirinaki River (Plates Nos. 14–15).

The conversion of logs extracted from Dusky State Forest (Southland) in the course of thinning operations was continued. As has been explained in previous reports, this project was commenced some years ago; a contract was entered into with a sawmilling company who takes delivery of the logs at convenient points on the forest roads, the trees being felled and snigged to loading-banks by Forest Service employees. At the close of the year the quantity so delivered was 139,238 cubic feet.

7. WEST TAUPO LANDS.

In accordance with the arrangements made with the Native and Lands and Survey Departments some four years ago this Service continued its regular patrol of these lands. It is satisfactory to report that no cases of trespass, vandalism, or fire were detected, as such misdemeanours were formerly fairly frequent owing to lack of regular official supervision.

It may be repeated for general information that these lands carry the largest stand of virgin forest in the Dominion, and their protection is a matter of vital importance to the whole community.

8. WAITANGI ENDOWMENT.

In accordance with the provisions of the Waitangi Endowment Act, 1932–33, planting was continued on a small scale; 16 acres were planted, the predominating species used were *Eucalyptus regnans*, *Pinus patula*, and *P. taeda*.

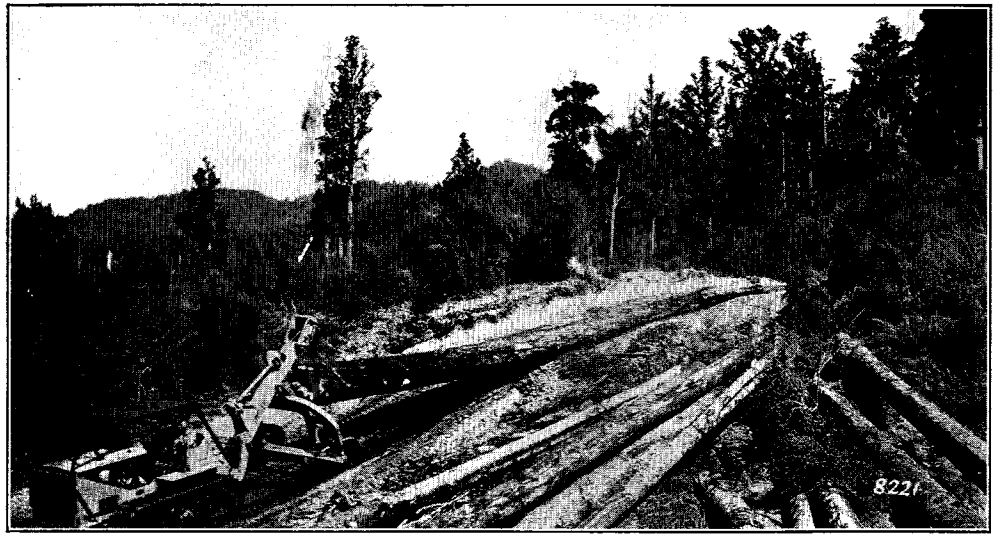

PLATE 14.—RIMU LOG, LENGTH 111 FT., GIRTH BREAST HIGH 9 FT. 6 IN., AND GROSS CUBIC CONTENT OF ALMOST 500 CUBIC FEET, BEING CONVEYED TO LOG DUMP BY TRACTOR AND ARCH.

TRACTOR-ARCH LOGGING AT TE WHAITI—MIDWAY BETWEEN WAIKAREMOANA AND ROTORUA.

To expedite selective logging and other cutting systems in the Whirinaki Demonstration Forest, a tractor and logging arch of the most modern design, and amongst the largest employed even in North America, is being operated. The equipment has proved well adapted to the topography and soil conditions of this forest.

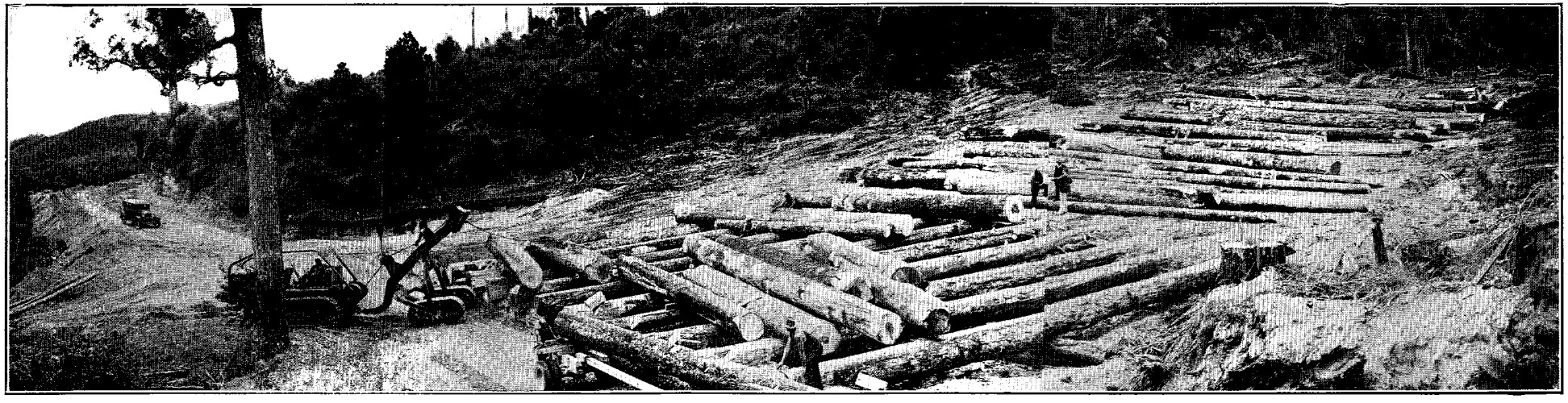

PLATE 15.—LOG DUMP AND SKIDS, SHOWING TRACTOR AND LOGGING-ARCH.

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An ornamental shelter-belt was also planted with 500 *Araucaria excelsa*; 5,000 *Agathis australis* were used for blanking an area of approximately 9 acres, and 53 acres were cleared in readiness for planting.

Road-maintenance and silvicultural treatment to the growing trees were carried out as required.

9. Forest Atlas.

Proclamations dealing with State forests necessitated fifty-three additions to the forest registers and affected areas totalling 446,256 acres, while the recording of these and State Forest Service privileges, &c., required 638 additions to the record plans in head and regional offices. Cruise plans totalling 91, and 115 sawmill licenses were prepared and forwarded to Head Office in addition to the usual number of grazing, tramway, and sawmill site licenses, splitting permits, &c., while four sixteen-mile-to-an-inch maps showing the forested areas of New Zealand as at 1850, 1880, 1910, and 1939 were compiled for inclusion in the Centennial Atlas.

In recording planting operations forty-four additions were made to the species and topographical tracings and sixty-nine species plans were prepared for departmental use. Four new topographical plans of part of Kaingaroa Forest were compiled and one of Omahuta.

One forest atlas sheet and a map of the Taupo-Rotorua fire districts (Plate No. 16), were prepared for lithography, and 200 and 1,000 copies respectively were printed. A second edition of that popular text book "Trees of New Zealand" was printed, 1,024 copies being received, and over 1,000,000 "fire-prevention" stickers were printed and 700,000 distributed. Helio and photostat prints prepared for this Service totalled 1,491, of which 282 were for regional use, while the number of negatives added to the photographic record was 447, making the present total 14,224.

The draughting staff of the Service experienced a busy year in keeping records up to date and in good condition, the Hokitika Office in particular requiring the services of a Head Office draughtsman for two months to cope with arrears of work.

CHAPTER II.—FOREST PROTECTION.

1. General.

The year's weather again held more than its share of surprises and catastrophes for the forester. Last year's report ended in the middle of an ideal autumn, and no fires were recorded thereafter until the ensuing spring. The dry autumn weather continued far into the winter in the South resulting in prolonged growth and, fortunately, not followed by any severe destroying frosts.

The spring and summer were, however, long delayed; and very severe local storms were experienced as late as February. The station that suffered worst damage from these was again Rotoehu State Forest in the Bay of Plenty. Persistent wind and stormy weather here prevented nursery sowings from being completed until 4th January, although the operation was begun as early as mid-October. The final week of January ushered in a steady gale in the valley, culminating at the end of the week in a particularly violent storm which completely destroyed 65 acres of tobacco and some acres of nursery trees, both in lines and under frames. The very light pumice soil at this station piled inches deep over the frames, and cut both germinating trees and planted tobacco to ground level.

This storm virtually ended the unseasonable weather except in the far South, and a drought period ensued with abnormal fire danger in Rotorua, Wellington, and Nelson Conservancies. Nelson in particular experienced the driest January–March period since 1883, the rainfall for that quarter being only 1·24 in. Fortunately, in that district, the latter part of this drought was marked by almost complete absence of wind. Very numerous fires occurred there, mainly from settlers' burns in the heavy fern and other growth accumulated from the preceding run of wet seasons; but the incredible exertions of the field staff, together with the almost universal voluntary assistance undertaken by the whole local rural population, kept fire damage down to a figure much below what might have been expected. No fires entered planted areas and no commercial stands of timber were burned, though 1,700 acres of forest country were lost through fire. It is also worthy of note that the drought was so severe that numerous patches of native beech on rocky faces in protection forest died out completely.

2. Forest Fires.

The forest-fire season in Nelson—perhaps the conservancy of greatest hazard save in exceptional seasons—has been discussed above. Elsewhere, save in Southland where the summer was wet, the hazard during most of the season was little above normal.

The bulk of the fire-fighting activities were on areas outside of forest boundaries, where many cases occurred of large fern and scrub fires of unknown origin. In Rotorua one such fire of roadside origin traversed some miles of country before it was brought under control a bare chain from the boundary of Waiotapu State Forest.

Canterbury experienced the only fire that originated internally in a State forest. During one of the violent nor'westers to which the district is subject a spark from the tractor-exhaust ignited dried grass on a firebreak which was being ploughed. Despite immediate action by the tractor-driver, the fire spurted before the wind into the adjacent compartment, and 64 acres of young pines were destroyed before the necessary fire crews could be assembled and put into action. Those who know the features of a true Canterbury nor'wester in mid-February will appreciate the fact that restriction of a fire under such conditions to a bare 64 acres in a solid forest of 22,000 acres of young pines in the thicket stage is in itself adequate testimony to the efficiency and speed of the alarm system and assembly methods. The source of origin of this fire was one that had not previously been encountered or anticipated, and steps are being taken to ensure that it cannot recur.

A most gratifying feature of this fire season is the number of times that neighbour property-owners have sought State Forest assistance either to supervise their own grass fires adjoining State Forest or to control other large fires menacing private property in forest-fire districts. In the latter cases, the value of having abundant reserves of organized man-power at call in certain areas has been fully appreciated, and the full cost of the "turn-out" applied for has been willingly paid by the property-owner sending out the call.

Summary of Fires, 1938–39.

1. Total fires reported as endangering State forest	31
2. Fires in State forest	20
3. Causes of fires—	
Burning off and settlers' fires	15
Unknown	10
Hunters	3
Billy fires	1
Tractor-exhaust	1
Carelessness	1
	31
4. Distribution of fires in State forest—	
Auckland Region	7
Rotorua Region	..
Wellington Region	3
Nelson Region	8
Westland Region	..
Canterbury Region	1
Southland Region	1
	20
5. Acreage burnt over in State forest—	
Milling timber	5
Logged areas	223
Young timber	200
Protection forest	446
Plantation	162
Fern, scrub, &c.	3,512
	4,548

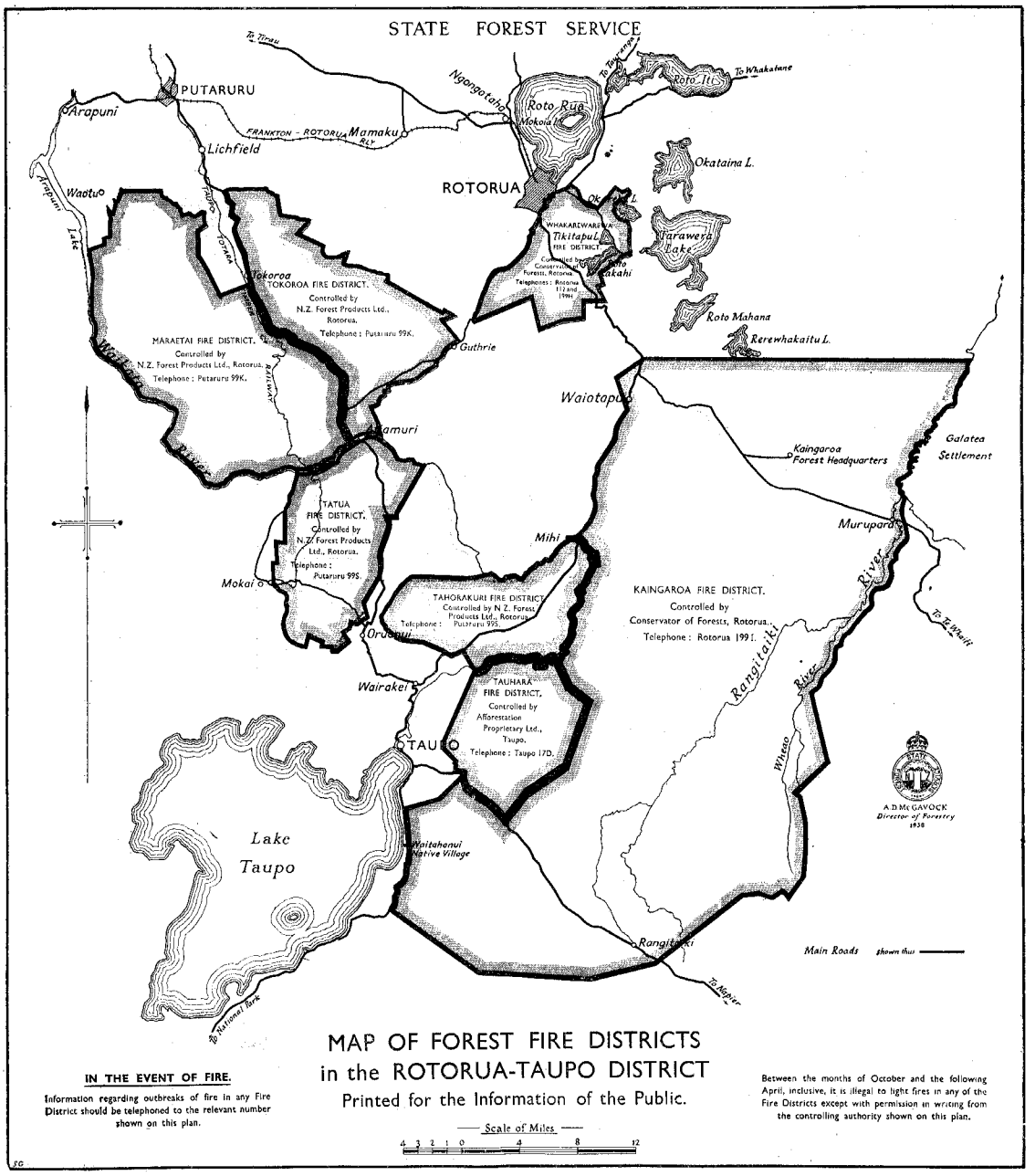

PLATE 16.

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FIRE-PREVENTION.

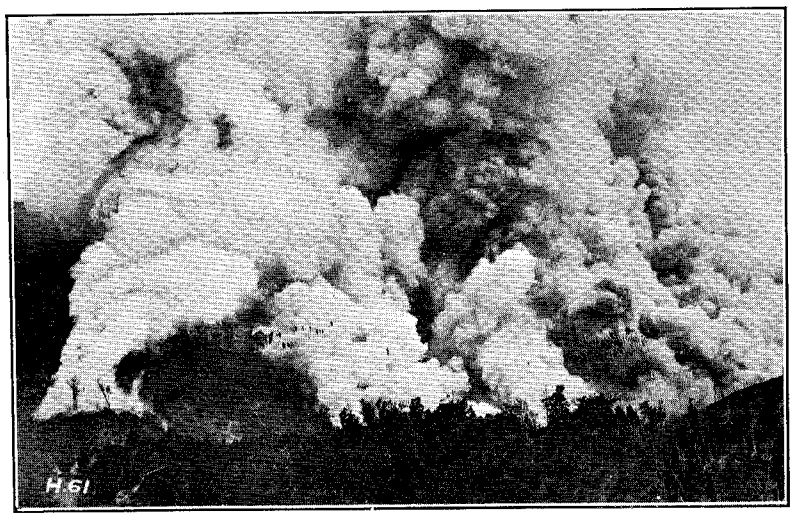


PLATE 17.—FIRE, THE WORST ENEMY OF THE FOREST.

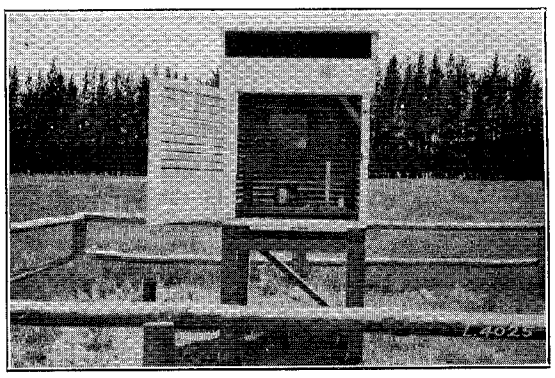


PLATE 18.—LOUVRED SHELTER WITH FIRE-CONTROL INSTRUMENTS FOR PREDICTING DANGEROUS FIRE CONDITIONS.

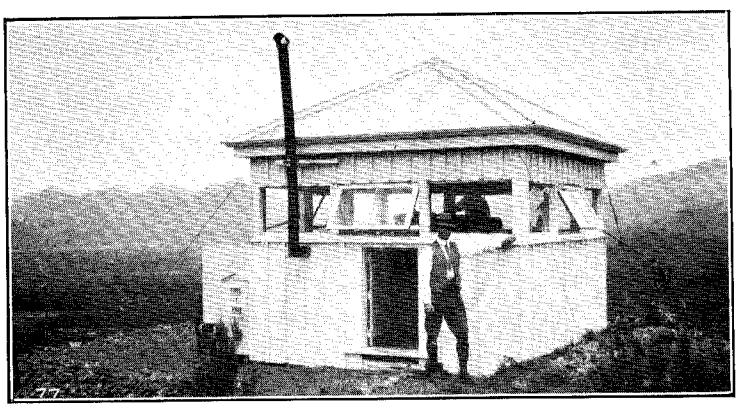


PLATE 19.—LOOKOUT STATION FOR THE DETECTION OF FIRES.

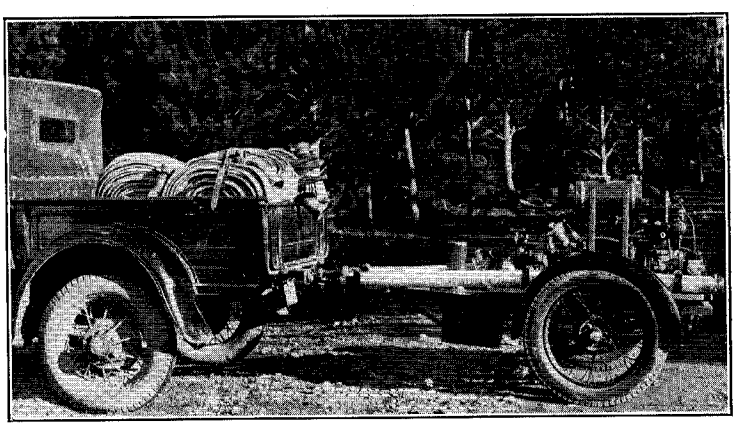


PLATE 20.—MODERN FIRE-PUMP FOR SUPPRESSION OF FOREST FIRES.

3. Fire Districts.

The area subject to forest-fire-district legislation was increased during the year by 80,000 acres, bringing the total area so protected up to 3,203,558 acres.

During the year consideration was given to several proposals to increase this area in a wholesale manner by the issue of "blanket" proclamations over very large areas of unsettled or sparsely settled countryside. The proposals were finally rejected, because the essence of effective fire-district protection is intensive administration. Proclamation of fire-district restrictions in remote country where no patrolman could penetrate except at irregular intervals, and where no protective force could be assembled to deal with the occasional fire which does occur, would have the effect of making the law a dead-letter: and it has been deemed preferable to confine proclamations to areas where there is reasonable chance of enforcement of the preventive provisions.

Plate No. 16 is a reproduction of a map of the fire districts near Rotorua and Taupo, and is published to direct the attention of the public to their obligations in that locality.

4. Fire-control.

Up to the present time it has been customary for forest officers to rely wholly on their local experience in deciding whether or not danger from fire is likely to arise. As an index of inflammability in the forest the feel of moss and other types of fuel has commonly been used, but, owing to the rapidity with which conditions have recently been shown to change from relatively safe to very unsafe, it has been necessary to develop a more scientific approach to the determination of relative fire hazard. While ordinary meteorological equipment is of considerable use in this connection, it has been found necessary to supplement the usual rain-gauge and wet and dry bulb thermometers with specially-designed psychrometers and moisture-content-indicator scales, the purpose of which is to measure directly the moisture content of various types of forest fuel by simple weighings of specially prepared "fire sticks" representative of each type of fuel.

Equipment for twenty stations has been secured and is now in course of erection. Plate No. 18 shows a louvred shelter within its fenced enclosure which also protects the rain-gauge and the "fire sticks" resting on wires several inches off the ground. In the interior of the louvred shelter the special psychrometer with its wet and dry bulb thermometers and the small hand-driven fan for drawing air across the bulbs may be seen at the right hand side. At the left side is mounted a moisture-content-indicator scale on which the "fire sticks" are periodically weighed, while in the centre may be seen a hygrograph recording graphically wet and dry bulb thermometer readings.

Factors conducive to fire hazard are:—

(*a*) Absence of rain—measured by rain-gauge.

(*b*) Low relative humidity—figures obtained from tables using the dry-bulb temperature and the "depression of the wet bulb" induced by a draught of air over the bulb. The thermometers on their mount may be whirled, as in the wall-mounting psychrometer, or the requisite air-current may be produced by a fan, as previously described.

(*c*) Warm temperatures—recorded by the dry-bulb thermometer of the psychrometer.

(*d*) Wind—the Beaufort scale estimates may be supplemented by anemometer readings. Evaporation and rate of fire-spread increase with the wind velocity.

(*e*) Fuel inflammability—a product of the foregoing interrelated conditions. The wood of which the "fire sticks" are made becomes wet during rain, dries out slowly under calm warm conditions, but very much faster with wind, and follows closely the variations in the relative humidity of the atmosphere. It represents as nearly as possible the scrub, fern, and dry timber in which outbreaks of fire commence.

Readings of relative humidity taken thrice daily generally indicate the approach of dangerous conditions, the "fire sticks" recording their cumulative effect. The

rating of the individual factors contributing towards the condition of extreme fire hazard must necessarily vary with locality. In parts of North America a relative humidity of 40 per cent., if maintained for a certain period, is regarded as dangerous during the summer-time. In New Zealand records have indicated a danger-point closer to 50 per cent. when a wind is blowing. In any case, an approach towards the danger-point can determine the extent to which increased vigilance by look-outs and extended patrols on roads are necessary. The dangerous periods require more frequent instrument observations, and when they show extreme hazard radio requests for complete cessation of operations by all direct-fired equipment in the forest may be issued.

The first three fire-weather stations were set up at Kaingaroa, Ketetahi, and Karioi, and their inauguration was the prelude to the occurrence of hazardous conditions. Records from these stations, together with meteorological station readings from other centres, made possible the broadcasting of warnings for which ample justification was immediately forthcoming in the series of fires reported. Some twenty stations throughout New Zealand will aid the Service in being prepared for future eventualities.

An instance of the application of instrument readings to fire hazard is :—

(*a*) Humidity at 1 p.m., 50 per cent., dropping to 40 per cent. by 4 p.m.
(*b*) Temperature at 1 p.m., 70° F., rising to 79° F. at 4 p.m.
(*c*) " Fire sticks " dropped to 8·5 per cent. at 6 p.m., when fire reached its height.
(*d*) Wind force during morning recorded as Beaufort 5.

The week preceding the fire was almost wholly fine with humidities high overnight, dropping occasionally below 40 per cent. in the afternoon. Under those conditions the hazard sticks often registered less than 10-per-cent. moisture content and showed a progressive drying out, which was accentuated on the day of the outbreak by the fresh morning wind and high afternoon temperatures. It is thus possible to conserve expenditure and concentrate patrols and fire-fighting equipment to deal with such situations.

5. Animal Destruction.

The total kill this year by Forest Service operations was 19,435, a very marked decrease on the figure for several years past. The decrease in numbers was accompanied by a £2,000 decrease in costs. These decreases are a welcome indication that the anti-rabbit campaign, which has for some years past been intensively carried on in certain large-planted areas, is at last showing a measure of success. The continuous campaign has in each case locally weakened the rabbit population, and the growth of the planted pines into the thicket stage has at last created an environment unsuitable for the rabbit pest, which survives only as small colonies or stragglers on fire-breaks, river-banks, and unplanted waste areas.

The number of opossums killed as nuisances—*i.e.*, killed under permit, as distinct from those killed by licensees for fur sales—has increased from 336 to 455. This kill was wholly on one planted area in Westland, where field evidence now puts it beyond dispute that this Australian animal is a serious menace to plantations of certain exotic species. It is curiously selective in its feeding, but, unfortunately, it is now showing a marked preference for sapling western red cedar (*Thuya plicata*). Its point of attack is the same as in certain pines—viz., about 4 ft. to 6 ft. below the tip of trees 16 ft. to 20 ft. high. At this point it gnaws the soft clean bark on both main stem and laterals, leaving extensive bare areas, where rot sets in or where wind later snaps off the top. It is worth recording that the opossum is now known to feed freely on the following exotic species :—

Pinus palustris : The large bud of small-planted stock is eaten out.
Pinus ponderosa : Buds and bark both eaten freely.
Pinus muricata : Bark eaten from leaders.
Thuya plicata : Bark eaten from leaders.
Larix decidua : Occasional trees chewed and deformed.
Cryptomeria japonica : Leader bitten off at all stages.

6. Forest Pathology.

No fungal disease has manifested any new or significant features in the growing forests, either native or exotic during the year. Mycological work has centred around timber problems and the choice and supply of preservatives for large-scale application in the rapidly developing market for exotic timbers both sawn and in the round.

On the entomological side, regular routine inspections have been made of the progress of insect infestation in the indigenous milling areas burned over in December, 1937, on the Central Volcanic Plateau (see report for last year). Whilst the insect population is increasing in these areas, the increase has not yet been sufficient to cause any significant decrease in the quantity or quality of the timber being removed from the area. It is, however, virtually certain that the incoming brood season will release a new population which, reinforced by the increasing amount of dote in the log, will gravely depreciate the value of any areas then remaining uncut.

Another interesting and significant phenomenon was investigated in the virgin *Nothofagus* forests of the north-western portion of the South Island. Here comparatively large areas of beech forest of all ages were seen to be dying in sites often far removed from any timber-cutting, farming, or other human activity. Examination of many of these areas revealed the fact that they were in valleys that had suffered severely from earthquake shatter in the 1929 earthquake, when large areas of this type of forest were there razed to the ground. It would seem that forest adjacent to such areas of complete destruction must have suffered severe strains and that probably its root equilibrium was completely disorganized. Whatever be the cause, it is certain that these areas have experienced a remarkable increase in the population of *Nascioides enysii*, a buprestid beetle which is a normal denizen of beech forest in balance with the rest of the forest population. The larvæ boring in the cambial region have now killed large patches of beech that appeared to have survived the earthquake of ten years ago. It is not, however, anticipated that serious and permanent damage will result, because the decade that has been apparently necessary for the insect to reach its present population density has also provided two beech-seed years of the greatest abundance, and regrowth of seedling and sapling crops even on bared acres is everywhere visible. This investigation, therefore, although it has at present no bearing on the strictly commercial forests, throws a most interesting light on what must have been a commonplace happening in primeval forest life-history in that district.

CHAPTER III.—UTILIZATION.

1. Administration.

During the year ended 31st March, 1939, a commencement was made with the construction of the buildings and the installation of the equipment for the sawmilling, boxmaking, and creosoting plants which are to be used for the conversion of the State exotic forests into marketable timber products. The major installation at Waipa, near Rotorua, is rapidly nearing completion and will be in operation before the end of the current year.

The Service continued to be represented, in association with the Department of Industries and Commerce, on the Government Timber Price Committee, which commenced operations in 1936, and during the past year it investigated the prices, production, and distribution of forest produce of all types and forms both wholesale and retail.

(a) Prices.

Since March, 1938, the awards operative in the sawmilling, boxmaking, and allied industries have remained unaltered, and consequently the prices of practically

all forms of forest produce have remained stable since that date. In December, 1938, an increase of 10 per cent. in rail charges necessitated investigation into affected prices, but a great part of the country's timber business being on an f.o.r. price-point basis and freight increases automatically carried by the buyer, few alterations to price-lists were necessary, while in a number of other cases producers and merchants were able, owing to the general increased demand for timber products, to absorb the increase.

(b) Export Butter-box Pool.

For the third successive dairying season the Department assisted the New Zealand Dairy Board in the purchase and distribution of export butter-boxes in the North Island. The Government Timber Price Committee also continued to act as adviser to the Minister of Agriculture on technical and trade problems arising from the administration of the Butter-box Pool Regulations. The organization of this particular trade is now stabilized, and an ample supply of reasonably priced high-grade containers appears assured for many years to come. It is regrettable to record for the second season in succession a decreased production in butter, and this is reflected by the fact that the demand for export butter-boxes for the current season 1938–39 was 15 per cent., or approximately 700,000 boxes, less than during the 1937–38 season.

The 1938–39 season is noteworthy for two far-reaching and important decisions made in respect of export butter-boxes, viz. :—

(1) The Dairy Division, Department of Agriculture, amended the Dairy-produce Regulations to permit the use of only one type of butter-box for the export of butter, its choice falling upon the $\frac{5}{8}$ in. plain-end box with $\frac{3}{8}$ in. sides, top, and bottom. This box, therefore, becomes a Dominion standard.

(2) The Export Butter-box Pool Regulations were amended to provide for the pooling of freights on export butter-boxes between box plants and dairy factories.

With minor exceptions, no difficulty was experienced in keeping box-plants adequately supplied with white-pine. Actually at one stage of the season, due to the marked decline in butterfat-production, boxmakers' yards were filled to capacity, and it was necessary to permit a limited export of white-pine to Australia until local users could accept further supplies. In this connection the Service desires to record its appreciation of the manner in which the timber industry, particularly the West Coast Sawmillers' Association, of Greymouth, assisted to ease the position by reducing production to a minimum and thus conserving supplies for local consumption.

As the boxmakers under the pool scheme are reimbursed for their delivered timber-costs, the increase in rail freights previously referred to had to be taken into the Pool Account, and this charge, together with a similar one for increased freights on boxes, particularly on nailed-up boxes, made necessary a revision upwards of pool charge-out prices as from the 1st January, 1939. Contrary to oft-expressed opinions, even these increased prices are well below those which ruled in the early post-war years, and, the pool reserve being virtually unimpaired at the close of the season, it is anticipated that the final price for standard boxes will not exceed 1s. 10½d. in shook and 2s. nailed up.

The figures in Table 8 have been secured from the Government Statistician to illustrate the trend in butter-box and white-pine prices since the war period, and the figures, together with the graph constructed therefrom, supply irrefutable evidence that the price of butter-boxes is neither excessive nor above that ruling at comparable periods.

TABLE 8.—AVERAGE PRICES OF BUTTER-BOXES AND WHITE-PINE, 1922–39, COMPILED FROM FIGURES SUPPLIED BY THE GOVERNMENT STATISTICIAN.

Year ended 31st March,	Average Value of Butter-boxes ex Box-factory (Actual Box-factory Realization).	Average Value of White-pine for 100 Board Feet f.o.r. Sawmill.
	s. d.	s. d.
1922	2 0·4	19 6
1923	2 0·5	17 6
1924	1 11·6	17 9
1925	2 0·5	18 5
1926	1 5·2	17 10
1927	1 6·2	16 1
1928	1 7·5	15 8
1929	1 5·1	16 5
1930	1 4·4	16 7
1931	1 4·8	15 6
1932	1 3·6	15 0
1933	1 2·5	14 4
1934	1 2·6	14 9
1935	1 2·3	14 9
1936	1 2·2	15 7
1937	1 7·4	16 6
1938	1 7·4	18 8
1939 (estimated)	1 9·3	19 2

While the price of butter-boxes has fluctuated to a much greater extent than that of white-pine, much of the variation in box-prices is due to changes in the types of container used from time to time—thus, while thirty-three Saranac-type boxes were being manufactured from each 100 board feet of timber as compared with only twenty ½ in. plain boxes, a difference of as much as 7d. per box occurred between the price of the two types, and, whereas only 29 per cent. of Saranac-type boxes were used in 1931, 61 per cent were used in 1935.

Actually the low prices of the 1929–35 period are more apparent than real, being the result of cut-throat competition and depression tactics on the part of both box-manufacturers and dairy-factories. This resulted in the use of containers

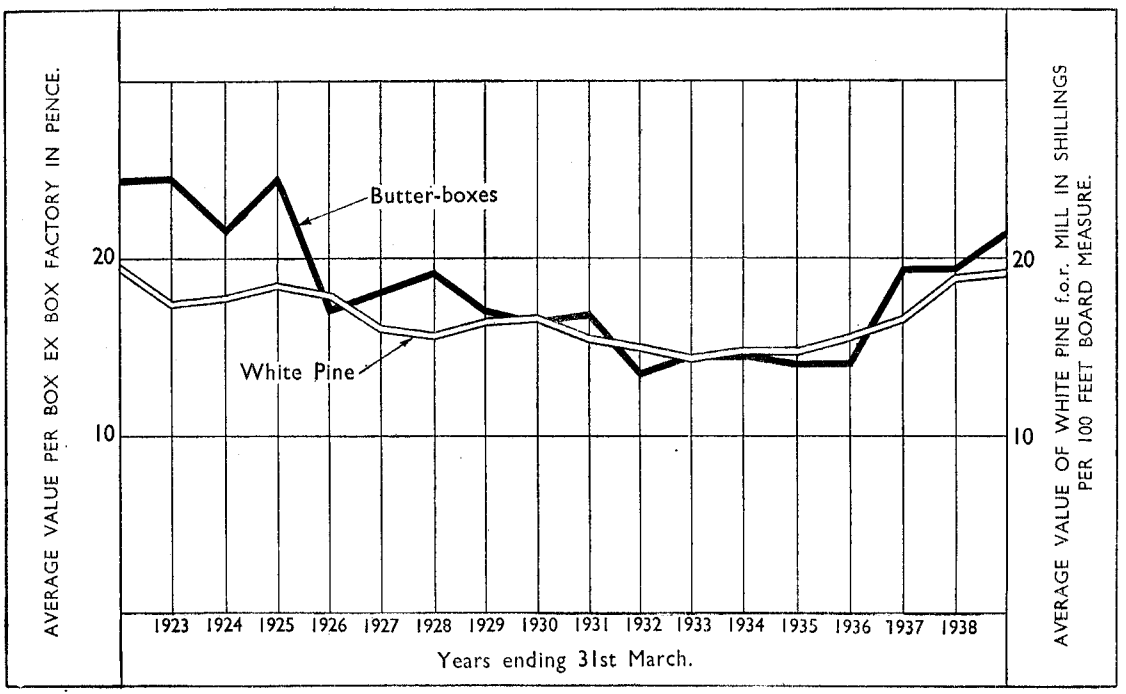


FIG. 4.—AVERAGE PRICES OF BUTTER-BOXES AND WHITE-PINE, 1922 TO 1939, AS REPORTED TO GOVERNMENT STATISTICIAN.

well below regulation minimum requirements, so that such prices cannot strictly be compared with those ruling either previously or subsequently, unless first increased by 2d. per box. If, in addition, the subsequent recovery of white-pine prices to their previous level is taken into account, equivalent to almost 3d. per box, and a similar amount added to cover extra freight costs, to-day's price is not only reasonable but cheap.

Never before have the interests of the dairying industry been so well protected. It has a standard super-fine container hailed by the British markets as the world's best; it has the Dominion's white-pine supplies conserved for its own use, with exports virtually eliminated by a reduction from over 20,000,000 to only 2,000,000 board feet per annum; it has white-pine prices determined on a fair production basis and not on a much higher export parity basis; it has, for the first time in the history of the trade, ample stocks of well-seasoned timber in the box-plants, and likewise adequate stocks of boxes in reserve against unforeseen fires and shortages; and last, but not least, it has one of the world's cheapest boxes when quality, exacting requirements, and value of contents are considered. It may be mentioned that the present box costs less than 4 per cent. of the value of its contents as compared with double that percentage for many other boxes and their contents in both the export and domestic trades.

(c) Organization of the Supply of other Containers for the Export Produce Trades.

The supply and prices of cheese-crates were again the subject of review by the Government Timber Price Committee. Due to the consolidation of Timber Workers' awards in March, 1938, a slight increased cost of production had to be faced by cheese-crate manufacturers, and necessitated an increase of 1d. in the price of export cheese-crates for the 1938–39 season over the previous year's prices.

The quality of some cheese-crate battens again left much to be desired. It will be recollected that when local shortages of insignis pine occurred some five years ago temporary approval was given to the use of rimu, matai, miro, and totara for cheese-crate battens. Not unexpectedly brittleness and lack of strength of the totara led to its almost immediate disuse, but the remaining species, although inherently unsuitable for the purpose, have continued in general use in some localities. More recently, however, grading stores in both New Zealand and Great Britain have been extremely critical of crates constructed with rimu, matai, and miro battens, and the complaints in regard to excessive breakages have now become so serious that the use of these species should be discontinued, more especially as an adequate supply of insignis pine for the whole of the Dominion's requirements will soon be available.

The supply of export fruit-cases was again organized by the New Zealand Fruitgrowers' Federation in co-operation with the Government Timber Price Committee and the New Zealand Boxmakers' Association. The policy of the New Zealand Fruitgrowers' Federation in arranging for an appreciable percentage of the season's manufacture to be undertaken during the off-season months of the year has resulted in economizing boxmaking costs due to uniformity of operation and avoidance of overtime at periods of peak demand.

With a reduction in the annual production of white-pine in the North Island from approximately 30,000,000 board feet to almost half this figure over the last three years, a shortage of staves for the manufacture of tallow and pelt casks has tended to develop amongst North Island freezing companies, but is being met by specifications revision, and by the shipment of supplementary supplies from the South Island. Provided cask-manufacturers make known their requirements well in advance of the season, no serious difficulty can arise in meeting their requirements.

Prior to the introduction of the Import Control Regulations exporters of tinned meats and certain other products have used imported cases for their export trade, these containers, due to the granting of drawback, being admitted on an equivalent duty-free basis. Investigations are now in progress to determine the practicability of manufacturing the cases locally, and it is anticipated that by rigid economies in production-costs a case equal in quality to the imported will be available at a competitive price.

2. Operating Technique.

(a) Logging and Tramming.

Logging continues to rank as the most efficient section of forest-utilization work in New Zealand. Having regard to the low stand per acre and the rugged topography in many regions, New Zealand logging operations compare much more favourably with modern practice in other countries than either the sawing of logs or the seasoning, grading, and merchandising of timber.

Tractor logging is being employed under widely diversified conditions, and with each passing year the limitations imposed by both soil conditions and topography are becoming better appreciated. Under most conditions it would appear that this type of logging is best employed as supplementary to orthodox ground skidding, the outstanding exceptions being in easy country or where heavy tramway-construction costs for relatively small areas of timber can be avoided by comparatively long tractor hauls.

As referred to elsewhere in this report, the State Forest Service inaugurated during the year the first logging-arch operation to be operated successfully in New Zealand. Previous experience had indicated that downhill logging with this type of equipment is virtually essential and that poor soil conditions must be avoided. In the belief that the topography and soil conditions at Te Whaiti (sixty miles east of Rotorua on the Rotorua–Waikaremoana Road) were favourable to the employment of tractors and logging-arch equipment, two of the largest and most modern Diesel-engined tractors, together with a suitable-sized logging-arch, were imported from North America. Although much doubt has been voiced regarding the adaptation of such equipment to New Zealand conditions, subsequent experience has confirmed the judgment of the Department, and it is now recognized that under suitable topography and soil conditions the logging-arch enables a tractor to log anything from 50 per cent. to 100 per cent. in excess of the quantity hauled by the tractor alone. Incidentally, it is noted that the servicing and spare parts facilities being provided by tractor manufacturers are steadily improving, an essential development if tractor logging is to find a more general vogue.

The improved reliability of Diesel engines, together with their low fire risk as compared with direct-fired steam equipment, has created considerable interest in their adaptation for both logging and tramming purposes, and it is anticipated that during the current year several experimental Diesel-engined haulers and locomotives will be placed in operation. The extension of selective logging elsewhere referred to will intensify this development.

In view of the Government's determination to exercise an ever-increasing measure of control over the use of all land in order to minimize erosion and improve stream regulation it is necessary to draw attention to the excessive damage which results from high-lead logging. The almost complete destruction of all forest growth, either over large areas or in wide swaths through the forest not only directly damages the protective value of the forest, but also creates an extremely hazardous fire risk, and should any fire eventuate under favourable conditions it may develop into a major conflagration. The position is bad enough where the destroyed forest growth is of a purely protective value, but where there are levelled to the ground a hundred or more trees per acre which under forest management could be grown into merchantable timber it is obvious that this particular type of logging should no longer be countenanced and, as previously referred to in the policy section of the report, will be entirely prohibited in all State forests containing young and advance growth of merchantable species, such as those on the coastal plains of South Westland.

(b) Sawmilling, Woodworking, &c.

There is little to report since last year regarding the operating technique of sawmilling, but in the woodworking field considerable remachining and improvement of plants has occurred.

The disadvantages attached to circular sawing become more apparent each year, and there is little doubt that the inherent inaccuracy of circular sawing has made it much easier for wallboard and other substitutes to replace rough-sawn

timber for various purposes. In remanufacturing plants, particularly box-factories, excessive waste due to uneven sawing is all too common, and an investigation is now being made into the possibilities of improving circular-sawing equipment to minimize the inaccuracy of its operation.

As indicated in the last annual report, a mill is now in course of erection at Whakarewarewa for the purpose of demonstrating the inherent accuracy of log-frame sawing, and it is anticipated that with this equipment operating before the end of the current year it will be possible to deliver to the domestic and export box trade a high class of container such as was previously available only by importation.

The most interesting addition to the Dominion's woodworking equipment during the year was the installation in one of the largest box-factories of a Linderman machine for the building-up of wide stock by multiple dove-tailing of narrow boards. Although one machine of this type has been in operation for many years, the latest installation incorporates many improvements in design and operation. An automatic multiple crosscut saw has also been installed for the production of box parts from the Linderman built-up stock, and this likewise has proved an economical innovation. The two machines are responsible for a material improvement in the general quality of the boxes manufactured at this particular factory.

Considerable interest is also being displayed in the possibility of expanding the local manufacture of plywood and veneer. A slicing machine and press, which are under order, will materially increase the quantity and range of veneers produced from New Zealand woods and will make possible the local production of matched panels in figured New Zealand timbers.

The local production of turnery products which has been steadily increasing for several years has been given fresh impetus and encouragement by the Import Control Regulations. A comprehensive collection of automatic turning and accessory equipment was imported during the year by one of the more progressive firms, and to the previous list of locally manufactured turnery products consisting of wooden heels, brushware, tool-handles, and meat-skewers there can now be added wooden lasts, lawn-mower handles, and clothes-pegs.

(c) Drying of Timber.

The apprehension which the State Forest Service has expressed during recent years in regard to the limitation of use of air-dried timber has proved to be well-founded. As usual, when any sudden increase in building activity occurs, as over the last two years, the tendency is to employ timber which has not been thoroughly air-dried, with the result that unsightly shrinkage and splitting of timber develops in completed structures. Improvements in design, in insulation, and in central heating, which have been the trend in modern building practice, have served to accentuate these defects, so much so that both timber producers and merchants have been forced to consider the expansion of their kiln-drying facilities.

Hitherto the use of kiln-dried timber has been largely confined to high-grade doors and joinery, and its extension to flooring, weatherboarding, and interior finishing timbers has now become a matter of considerable importance. The forty modern kilns which have been erected during the past twelve years have a maximum drying capacity of 15,000,000 ft. board measure per annum, and an equal number of other kilns may perhaps have an additional capacity of 5,000,000 ft. board measure. Having regard to the fact that these kilns are also used for the drying of timber required for furniture and other industries, their capacity is much below current requirements, and it is anticipated that at least thirty additional kilns of modern design will be required during the immediate future.

(d) Grading.

The past year has been noteworthy for the success which has been secured in the adoption of New Zealand standards for the grading of sawn timber and other forest products. The National Grading Rules for New Zealand Building Timbers previously issued by the New Zealand Sawmillers' Federation as the result of joint conferences with and investigations by representatives of wood-consuming interests

RESEARCH IN TIMBER PHYSICS.

Salt seasoning of eucalypts and larch has eliminated spalling and increased the serviceability and strength of these timbers when creosoted.

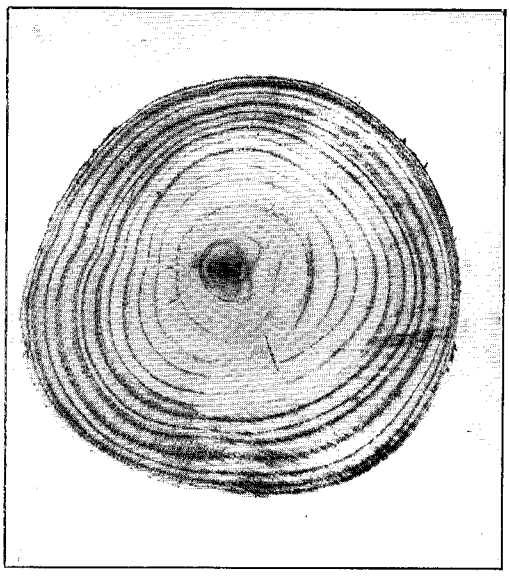


PLATE 21.—TYPICAL SECTION OF EUCALYPT POLE AFTER TREATMENT IN BRINE AND SUBSEQUENT AIR-SEASONING, SHOWING FREEDOM FROM CHECKING.

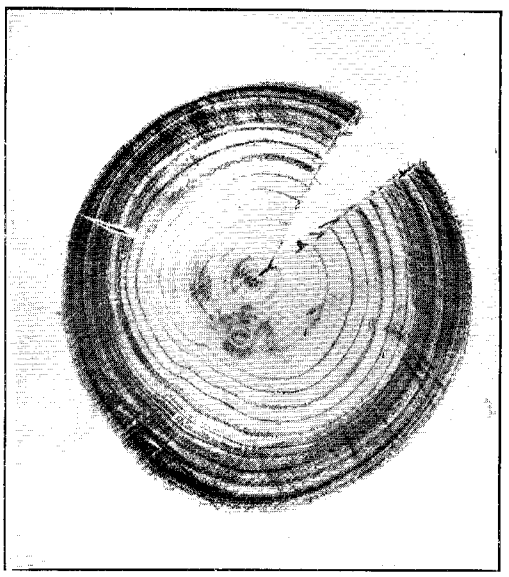


PLATE 22.—TYPICAL SECTION OF EUCALYPT POLE AFTER AIR-SEASONING ONLY, SHOWING SEVERE CHECK.

[*To face page 24.*

were critically examined by a Timber Committee of the New Zealand Standards Institute, and, as forecasted in last year's annual report, the revised rules have been adopted and issued by the New Zealand Standards Institute as New Zealand Standard Specification No. 169, "New Zealand Standard Specification for Classification and Grading of New Zealand Building Timber (National Grading Rules)."

Mention was also made in last year's report of the fact that a specification covering the supply of New South Wales desapped hardwood poles was ready for submission to the New Zealand Standards Institute, and during the year New Zealand Standard Specification 168, "The New Zealand Standard Specification for New South Wales Desapped or Dressed Desapped Hardwood Poles," was issued. Considerable progress was also made in the preparation of similar specifications for other round, sawn, and hewn New South Wales forest products, and standards in respect thereof will be issued during the current year.

The tentative standard grading rules for white-pine have proved their value during the year, but the failure of some producers to grade their cutting in conformity therewith has indicated the necessity for standard terms and conditions of sale which are accordingly now being investigated.

(e) Wood Preservation.

The past year has been one of intense activity in the sphere of wood-preservation, both in the erection of the three non-pressure treating-plants and in the preparation of posts and poles for creosoting. The Conical Hills plant is already in operation, and the Rotorua and Hanmer plants will be creosoting timber in the near future.

Large numbers of larch, pine, and eucalypt posts and transmission poles from the State plantations have been cut, barked, and stacked for seasoning. It is not the intention of the Service to confine creosoting to posts and poles, and provisions have been made for the treatment of gates and constructional timber generally. Particular attention has been paid to the use of creosoted timber in bridge-construction, and technical details of the composite timber-concrete bridges of the shear developer type have been obtained from America, where they are being increasingly used in highway schemes.

The correct degree of seasoning of posts and poles prior to creosoting is of primary importance, necessitating frequent moisture-content tests, and to this end a detailed technique has been developed to determine the rate of seasoning of all post and pole timbers in the three creosoting stations.

To ensure that creosoted poles and posts conform to a high standard in regard to uniformity of shape, limitation of defects, and efficiency in preservative treatment, specifications have been prepared and are already being applied.

The protection of all classes of wood products against fungal and insect attack continues to demand ever-increasing attention, with emphasis naturally falling on the preservation of building timbers, since these form such a large proportion of the Dominion's output of rough-sawn timber. The importance of good design, of supervision in erection, of inspection of timber during construction, and of maintenance of the finished building cannot be overstressed. These factors are fundamental to the longevity of all timber structures, and much of the trouble in the past has been due solely to their neglect. Damp sites, inadequate sub-ground-floor ventilation, the use of already infected and infested timber, poor timber-detail design and construction allowing entry of moisture to concealed parts, poor painting, and the storage of infected and infested timber either in the vicinity of or within the structure itself are the basis of the comment that timber in New Zealand has been "more often abused than used." Certainly if the timber for the Dominion's wooden buildings had been more intelligently employed the decay and insect attack which has since become evident in some cases could never gave occurred. Any attempts to correct the trouble merely by the use of treated wood will prove uneconomical, and the desired improvement in the serviceability of the structure cannot be attained other than by strict observance of the precautions already referred to. If these safeguards are faithfully observed there is little

doubt that wooden buildings, without the use of treated timber except in a few parts, will give a much longer life than is required either under any system of loan retirement or to keep abreast of changing living-conditions from century to century.

3. Research.

(a) Timber Mechanics.

The detailed data regarding the mechanical and physical properties of the principal indigenous and exotic timbers now possessed by the State Forest Service as the result of a comprehensive series of tests completed several years ago continues to find an ever-increasing field of usefulness.

The results of these tests have been applied during the year to the selection of timbers for numerous specialized purposes ranging from clothes-pegs and miscellaneous handles to aeroplane-construction. There are few wood uses in which serviceability is not in some way related to one or more strength properties, and the accurate knowledge which is available on the strength of the various woods in bending, compression, and shear, their toughness, rigidity, and other factors determining their resistance to all kinds of stresses, makes the data invaluable to wood users.

The further fact that the results of the tests are directly comparable with those of similar tests on practically all the world's most important timbers makes them of pertinent value in selecting locally-grown substitutes for imported timbers, and the ever-increasing inquiries received in this connection have ranged from door and furniture core-stock to meat-cases.

The work now being carried out by the New Zealand Standards Institute to unify and improve building by-laws has also been facilitated in respect to light wooden construction by the data available on building timbers.

(b) Timber Physics.

Requests for the identification of timbers continue to increase, and the reference set of microscopic slides built up during the last ten years, and now amounting to several thousand, has proved invaluable in expediting identifications.

With the increased use of wood by secondary industries the question of moisture content has become of paramount importance to both the timber trade and to wood-users. In many circumstances it is still necessary to resort finally to the oven-drying method of determining moisture content, but the slowness of this method has served to concentrate more and more attention upon the possibilities of using the various types of electrical moisture meters which have been developed during recent years. Tests of both the inductance and capacity type of moisture meter are now in progress, and the preliminary results indicate that the modern equipment has been developed to a point where its reliability and ruggedness warrants its application for many purposes, and reputable makes of various types can now be widely recommended.

The principal kiln-drying investigation undertaken during the year was one to study the possibilities of kiln-drying framing timbers, but, not unexpectedly, the inherent difficulty of drying without distortion the usual grade of scantling stock containing fairly large defects has proved uneconomical.

Of far-reaching importance has been the success achieved in the preliminary salt seasoning of locally-grown eucalypts and larch posts and poles. The excessive splitting of New Zealand eucalypts and larch under ordinary conditions of seasoning has hitherto proved a serious detriment in respect to their strength, but the immersion of the green timber in a strong solution of salt has given sufficiently promising results in the elimination of this checking to justify the extension of the tests on a commercial scale, and a large number of eucalypt poles and posts have been so treated at Rotorua preparatory to creosoting (Plates Nos. 21–22).

(c) Wood Preservation.

Improved laboratory facilities have made possible an increasing amount of valuable experimental work on several branches of wood preservation, including general diagnostic work, testing of preservatives, and paint research.

In addition to creosote, particular attention has been paid to another group of non-aqueous preservatives—namely, those carried in a volatile oil solvent, the chief characteristics of which are :—

(*a*) Freedom from objectionable odour.
(*b*) Quick drying after treatment.
(*c*) Do not cause swelling or distortion of timber.
(*d*) No detrimental effect on subsequent painting.

This Service strongly advocates the wider use of exotic pine timber in housing construction, and the volatile oil preservatives referred to above are the most suitable for the treatment of members particularly susceptible to decay, such as window-sashes. Of this group of preservatives, pentachlorphenol is considered by this Service to be the most promising on the scores of toxicity, permanency, and cost; research on the suitability of fuel oils available in New Zealand as solvents for this preservative have shown satisfactory results, and tests on a semi-commercial scale have been initiated.

The increasing use of insignis pine for weatherboarding has led to an investigation into the most suitable priming paints for this and similar timbers which have a tendency to cause flaking of paint from the knots and resinous summerwood bands. Overseas research indicates that the most satisfactory priming pigment for this special purpose is aluminium in long-oil spar varnish if used on dry timber, but a series of exposure tests are being conducted under field conditions to measure the serviceabilities of this and various other promising priming paints under New Zealand conditions.

Standard toxicity tests of all the creosotes of different origin and manufacture to be used by this Service have been carried out, and it is gratifying to record that their toxicities compare very favourably with those of standard American creosotes.

(d) Grading, &c.

With the steady increase in production and the wider use of exotic softwoods a need for definite grading rules on which they can be sold has become apparent. That the species will definitely be suitable for far wider fields of utilization than they at present enjoy is beyond doubt to those familiar with timber utilization in Europe and North America, but progress in this direction will be limited until grading rules rigidly specifying the limitation of defects are available. To remedy this deficiency a wide range of mill and utilization studies is being undertaken as a major feature of the State Forest Service's utilization programme during the current year.

Similar studies aimed at the standardization of sizes and profiles of the commonest finishing timbers such as flooring, weatherboarding, and match-lining are in progress.

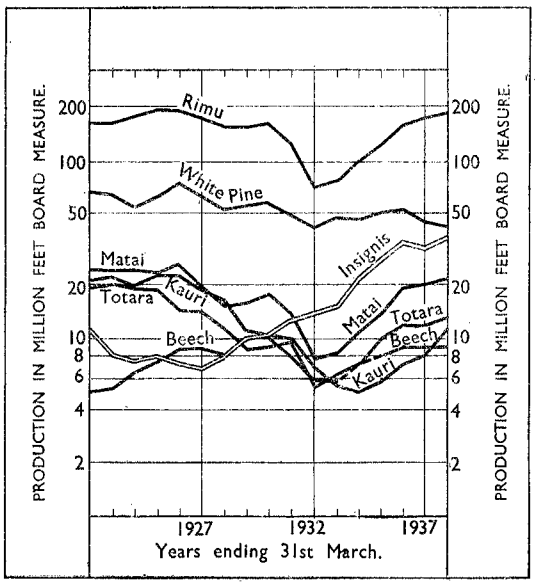
CHAPTER IV.—THE TIMBER TRADE.

1. General.

It is reported by the Government Statistician that the production of rough-sawn timber for the year ended 31st March, 1938, was 323,000,000 board feet, as compared with a predicted cut of 330,000,000 board feet. It is 5½ per cent. above that for the previous year, and constitutes the highest recorded annual cut since 1925–26. As judged by the undiminished activity in building construction during the year under review and the timber traffic over the New Zealand railways it is estimated that timber-production for the year ended 31st March, 1939, will be approximately 335,000,000 board feet.

For the current year ending 31st March, 1940, there is every indication that production will be still higher. The Government has found that the present rate of house-construction is insufficient to meet the current demands for dwellings and is making every endeavour to accelerate its housing programme, whilst a revival of private building is reflected by the doubling of State Advances loans over the last two years. The cut for the year ended 31st March, 1940, is expected to approach 345,000,000 board feet, which approaches closely the peak reported production of 353,000,000 board feet in 1925–26.

The percentages of the total production cut in the various provincial districts have remained practically constant during the past three years. The Auckland Province, embracing as it does the North and South Auckland and Rotorua districts and the principal timber-producing areas of the Main Trunk, continues to lead with 40 per cent. of the total production, while exotic forests already established on a large scale in this province by both State and private interests will assure to Auckland its premier place in timber production for many years to come.



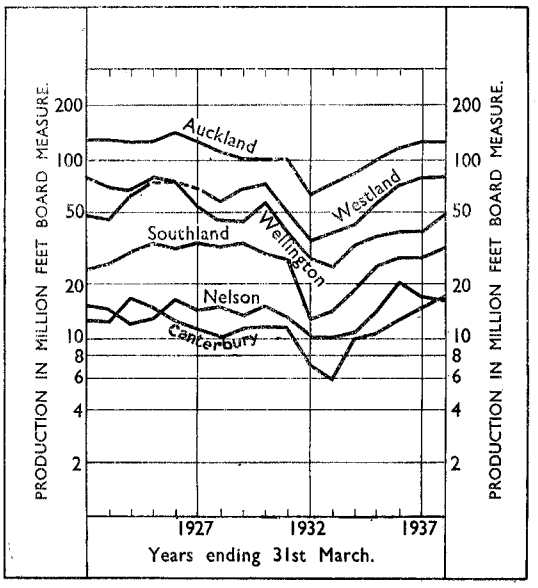


FIG. 5.

REPORTED PRODUCTION OF ROUGH-SAWN TIMBER BY SPECIES, 1922 TO 1938.

REPORTED PRODUCTION OF ROUGH-SAWN TIMBER BY PROVINCIAL DISTRICTS, 1922 TO 1938.

Rimu, the principal indigenous softwood and building timber, has during the past decade constituted approximately half New Zealand's timber-production and, as might be expected, reported the largest absolute increase for the year. The only increase in production of any magnitude were: Rimu, 10,000,000 board feet; kauri, 4,000,000 board feet; and insignis pine, 5,000,000 board feet.

The production of other species remained much the same as for the previous year, with the exception of white-pine, which, as a result of the Government conservation measures, decreased in production by 3,000,000 board feet. The 36,000,000 board feet of insignis pine produced during the year ended 31st March, 1938, established a new high record for this timber and indicates that the time is rapidly approaching when it will displace white-pine as the second largest source of sawn timber. While present production of this species may be considered to represent the maximum that the hitherto restricted supply of mature trees would permit, the early addition of supplies from the rapidly maturing State exotic plantations will prevent the possibility of any immediate shortage and provide for an expending future demand.

2. DOMESTIC MARKETS.

A pronounced upward trend in building construction was steadily maintained throughout the year, and is reflected in the increased number of building permits issued. As reported by the Government Statistician, permits issued for the erection of dwellings during the year reached a total of 6,304, which is 30 per cent. higher than for the previous year, and strikingly demonstrates the acceleration of efforts to overtake the acute housing shortage apparent in recent years and primarily due to the abnormally low level of building activities during the depression period. The total number of dwellings erected throughout the Dominion and including those districts for which statistics are not collected is probably about 7,500. Included in the reported figure of 6,304 building permits were 2,678 for the State Housing Department, and it is estimated that of all dwelling-construction the various Government building and lending Departments control about two-thirds of the total.

While such activity in building construction *prima facie* betokens a good volume of business for the sawmilling industry, the benefit enjoyed by many operators is not as substantial as might be expected owing to the current building specifications used by the Government building and lending Departments tending to be restrictive and inelastic. At the same time it is necessary to correct the impression that the various authorities specify only heart timbers for their requirements. Not a single instance is known where an all heart-timber structure has been specified. Whilst quite a number, however, contain as much as 70 per cent. of other than heart timber, the qualities and grades demanded in the specifications have led to an unbalanced demand for the natural product of the log, and has resulted from time to time in the accumulation by sawmillers and timber-merchants of abnormally heavy stocks of certain grades and qualities owing to their exclusion from or restricted use under these specifications. On the other hand, the demand for other grades and qualities exceeds the supply, with the result that not only has much unsatisfactorily seasoned timber been supplied and used, but also the progress of building has been retarded. Investigations are, however, now in progress with a view to securing a utilization more consistent with the ability of the industry to produce, and it is confidently anticipated as a result thereof that the economic losses occasioned by the inability to find a use for the entire product of the log will disappear.

It is perhaps unnecessary to add that the modifications in building specifications necessary to secure this desirable end must be in full accord with sound building practice, but the experience of decades has provided unassailable evidence that where timber is used in a correctly seasoned state and houses properly designed, erected, and maintained, practically the entire product of the log can be used in house-construction without either any increase in maintenance-cost or decrease in the subsequent life of the dwelling.

Imports were again higher than for the previous year, and totalled 43,000,000 board feet for the 1938 calendar year, but represent virtually essential requirements for which no local substitutes are yet available. The increase in importation over the previous year occurred principally in Australian hardwoods required for Government and local-body constructional activities and in redwood imported to offset declining supplies of totara for joinery purposes. No importation of butter-boxes proved necessary during the current dairying season 1938–39, due to the efficient organization of adequate supplies of locally-made boxes through the operation of the Export Butter-box Pool and the restriction of white-pine exports. The figure shown in Table 9 represents the balance of an order placed as a precautionary measure in the 1937–38 dairy season before it was possible to completely organize white-pine production to meet domestic demands.

Imports of Japanese oak fell from 3,500,000 board feet to 2,000,000 board feet, due largely to the inability of importers to obtain shipment of their orders. The demand for this species is quite substantial on account of its popularity as a furniture timber, and an acute shortage has developed out of the desire of tenants occupying the relatively large number of new houses being built to install modern furniture in their new homes. A large amount of cheaper class of furniture has, of course, been supplied in rimu for many years, but as there is a general tendency to demand oak and other imported decorative timbers for new furniture or to carry on with old furniture the further substitution of local timbers must be limited for the time being to concealed parts if any contraction in the furniture trade is to be avoided. In the meantime, every effort is being made to improve the supply, grading, and seasoning of the local woods, and to educate the public to the decorative possibilities of rimu and silver beech when used in modern type of furniture.

3. Exports.

Exports of sawn timber continue to show a downward trend, amounting to 14,600,000 board feet for 1938, compared with 17,700,000 in 1937 and 27,000,000 in 1936. White-pine, rimu, and matai recorded decreases, the former due to export restrictions and the two latter to a general slackening in demand for building timbers on the Australian markets.

Control by regulations of the export of white-pine continued to be maintained throughout the year, and permits to export 2,000,000 board feet were issued after

investigation had proved that this quantity would be produced in excess of domestic requirements. White-pine for many years occupied pride of place in New Zealand's export timber trade, but future exports of this timber will be strictly limited to conserve the remaining essential supplies for domestic requirements. The export of white-pine will be slightly greater during 1939 on account of an increased surplus following upon a fall in dairy production over the past two seasons.

TABLE 9.—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, 1936–38. Value represents value in country of export, plus 10 per cent. expressed in terms of New Zealand currency.)

Item.	1936.		1937.		1938.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ft. b.m.	£	Ft. b.m.	£	Ft. b.m.	£
Hardwoods—						
Australian hardwoods ..	19,955,000	270,890	24,169,000	342,890	29,186,000	435,760
Oak	2,691,000	40,780	3,518,000	66,350	2,094,000	48,900
Total	22,646,000	311,670	27,687,000	409,240	31,280,000	484,660
Softwoods—						
Douglas fir	4,170,000	36,560	6,509,000	53,230	7,048,000	53,370
Butter-boxes	1,513,000	29,310	1,456,000	30,530	947,000	17,400
Redwood	2,115,000	28,120	1,718,000	24,760	3,064,000	47,500
Total	7,798,000	93,990	9,683,000	108,520	11,059,000	118,270
Other	682,000	16,690	2,084,000	39,570	892,000	6,100
Grand total ..	31,126,000	422,350	39,454,000	557,330	43,231,000	609,030
Laths, palings, shingles, &c.	..	5,587	..	2,909	..	3,731
	Tons.		Tons.		Tons.	
Tanning-bark	1,248	14,810	862	8,309	595	5,811
Wood-pulp	4,406	47,790	5,030	59,227	7,478	85,178

TABLE 10.—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, 1936–38.)

Item.	1936.		1937.		1938.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ft. b.m.	£	Ft. b.m.	£	Ft. b.m.	£
White-pine[2]	14,824,000	140,000	3,110,000	32,370	2,021,000	25,790
Rimu[3]	6,095,000	49,800	8,711,000	84,800	7,407,000	74,010
Beech	2,033,000	20,470	2,076,000	24,570	2,427,000	30,150
Matai	2,142,000	16,620	1,829,000	17,950	563,000	5,520
Kauri[4]	934,000	26,380	639,000	21,240	661,000	20,500
Insignis-pine box-shooks[5]	899,000	10,760	1,161,000	17,930	1,263,000	19,340
Other—						
New Zealand	29,000	670	131,000	1,990	188,000	2,090
Foreign	50,000	1,090	58,000	690	60,000	670
Totals	27,006,000	265,790	17,715,000	201,540	14,590,000	168,070
	Tons.		Tons.		Tons.	
Kauri-gum	3,237	96,160	3,226	151,590	2,034	103,777
Tanning-bark	..	..	19	150	2	27
Fungus	47	5,020	46	6,070	38	3,980

(1) 1936: 95 per cent. to Australia, 3 per cent. to Pacific Islands, 2 per cent. to United Kingdom; 1937: 91 per cent. to Australia, 6 per cent. to Pacific Islands, 3 per cent. to United Kingdom; 1938: 90 per cent. to Australia, 9 per cent. to Pacific Islands, 1 per cent. to United Kingdom. (2) Exported for butter-boxes, shelving, white-wood furniture, &c. (3) For flooring, linings, and joinery. (4) For floorings, linings, tanks, and vats, &c. (5) Principally for Pacific Islands fruit-cases.

TABLE 11.—REPORTED PRODUCTION OF ROUGH-SAWN TIMBER, BY SPECIES.

(From information supplied by the Government Statistician. All figures refer to the years ended 31st March, 1933–38.)

Species.	1933.	1934.	1935.	1936.	1937.	1938.
	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.
Rimu	76,193,000	96,125,000	125,488,000	157,631,000	174,779,000	184,588,000
White-pine ..	47,998,000	47,949,000	52,294,000	52,075,000	46,959,000	43,662,000
Matai	8,161,000	10,760,000	13,880,000	19,069,000	20,295,000	21,255,000
Kauri	5,410,000	4,946,000	5,553,000	7,332,000	7,791,000	11,575,000
Totara	6,347,000	7,197,000	8,867,000	11,778,000	11,444,000	12,794,000
Beech	5,781,000	6,972,000	7,725,000	8,855,000	8,809,000	8,825,000
Insignis pine ..	14,676,000	21,494,000	27,311,000	34,104,000	31,484,000	36,359,000
Miro	441,000	671,000	915,000	772,000	1,777,000	1,495,000
Tawa	290,000	214,000	746,000	25,000	439,000	454,000
Rata	72,000	97,000	92,000	126,000	155,000	56,000
Other	900,000	1,230,000	911,000	1,308,000	1,957,000	1,703,000
Total ..	166,269,000	197,655,000	243,782,000	293,075,000	305,889,000	322,766,000

TABLE 12.—REPORTED PRODUCTION OF ROUGH-SAWN TIMBER BY PROVINCIAL DISTRICTS.

(From information supplied by the Government Statistician. All figures refer to the years ended 31st March, 1933–38.)

Provincial District.	1933.	1934.	1935.	1936.	1937.	1938.
	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.
Auckland ..	74,261,000	83,915,000	100,780,000	118,538,000	128,602,000	131,467,000
Hawke's Bay ..	7,647,000	9,683,000	11,867,000	12,781,000	12,746,000	13,456,000
Taranaki ..	1,980,000	1,839,000	2,291,000	4,330,000	4,967,000	5,991,000
Wellington ..	15,157,000	21,312,000	22,731,000	22,937,000	21,696,000	29,527,000
Marlborough ..	3,374,000	4,041,000	2,954,000	2,511,000	1,817,000	2,164,000
Nelson	5,651,000	6,461,000	11,198,000	17,322,000	14,700,000	13,679,000
Westland ..	38,773,000	42,316,000	57,543,000	73,921,000	77,726,000	77,293,000
Canterbury ..	2,817,000	4,391,000	5,085,000	6,085,000	7,357,000	7,383,000
Otago	2,969,000	5,682,000	5,489,000	6,476,000	7,143,000	9,479,000
Southland ..	13,640,000	18,015,000	23,844,000	28,174,000	29,135,000	32,327,000
Totals ..	166,269,000	197,655,000	243,782,000	293,075,000	305,889,000	322,766,000

CHAPTER V.—GENERAL.

1. LEGISLATION.

The only legislation affecting this Service which was passed during the 1938 session is contained in section 55 of the Statutes Amendment Act, 1938.

This section amends the Scenery Preservation Act, 1908, and provides that on the joint recommendation of the Minister in Charge of Scenery Preservation and the Commissioner of State Forests the Governor-General may, by Proclamation, declare land subject to the Forests Act, 1921–22, to be a reserve under the Scenery Preservation Act, 1908.

The Export Butter-box Pool Regulations 1938, Amendment No. 1, includes amended provisions placing certain responsibilities on the Director of Forestry regarding the value of timber used by licensees—*i.e.*, persons licensed under the regulations to manufacture export butter-boxes or cheese-crates, or both.

2. Finance.

Receipts.

Gross receipts exceed those of last year by £8,469, the increase being due to logging activities in the Rotorua Region and increased demand, mainly in the Southland Region. Appended is a summary of the main items :—

Item.	1938-39.	1937-38.	1936-37.	1935-36.
	£	£	£	£
Indigenous forests receipts—				
Timber sales	103,394	96,741	91,980	74,828
Timber royalties and trespass	9,300	8,151	6,257	5,006
Leases, grazing	1,445	1,493	1,692	1,757
Sawmill-sites, industrial, &c.	1,616	638	705	957
Miscellaneous	6,673	4,934	4,252	2,844
National Endowment Account allocation	20,085	24,756	21,807	15,712
Nurseries and plantations—				
Trees and seeds	11,224	8,555	7,097	5,874
Firewood and poles				
Miscellaneous				
Totals	153,737	145,268	133,790	106,978

Payments.

The net expenditure of £422,073 shows an increase of £124,214 over the previous year. This is chiefly attributable to the expansion of the Service in preparation for milling operations both on indigenous forests and on plantations which, although ultimately to be revenue-producing, are as yet incomplete.

A table showing the expenditure for the last four years, under main headings, is appended.

Item.	1938-39.	1937-38.	1936-37.	1935-36.
	£	£	£	£
Fixed charges and staff salaries—				
Interest and expenses of raising loans	278	263	801	525
Staff salaries	63,422	57,185	51,616	41,374
Allocation of revenue—				
National Endowment Account	18,712	16,458	10,934	7,117
Local-body payments, &c.	12,556	16,329	16,739	9,243
Management, establishment, and development—				
Indigenous forests	47,765	22,205	17,863	14,763
Fire-fighting equipment and prevention	955	887	415	415
Educational: Reference library, &c.	534	341	194	260
Research and experimental equipment, &c.	1,318	988	567	836
Afforestation: Nurseries and plantations	214,721	177,141	139,761	60,642
Land-purchase	8,901	1,110	..	70
Miscellaneous	134	79	84	500
Sawmill and creosote plant, &c.	52,777	4,873	..	..
Totals	422,073	297,859	238,974	135,745

3. Recreation.

Improved road access, together with motor transport, have generally developed camping and widened the field of the recreational use of State forests. Every year increasing numbers of persons enjoy the privileges and facilities afforded by the Service to visit and camp in suitable State forest areas.

The protection of State forests from damage by fire and vandalism with this greater recreational use necessitated constant attention and vigilance by local forest officers.

The administrative policy of the Service encourages the recreational use of State forests under necessary but not irksome safeguards, and facilities are extended from time to time to meet the requirements of increasing popularity.

It is pleasing to report that no serious damage occurred during the past year from this source, notwithstanding an abnormally high fire hazard in many parts and the fact that no undue restriction of visitors to popular picnic and camping spots was made. This favourable position is no doubt due largely to the co-operation of the thousands who visited the forests in observing the simple rules regarding the use of fire in proper places and exercising reasonable care of the forest growth.

The kauri State forests of North Auckland, particularly Waipoua, Puketi, and Mangamuka, again attracted a large number of tourists and visitors, while next in popularity was undoubtedly the Hanmer exotic State forest in North Canterbury, which, in addition to individuals, was visited by several organizations.

Camping was enjoyed in suitable and conveniently located State forests throughout the Dominion, while in one case—State Forest No. 22 (Southland)—sixty-two camping permits were issued.

In addition to casual visitors and campers, some fifteen tramping clubs, alpine clubs, ski clubs and winter sports clubs, with an approximate total membership of three thousand, enjoyed the privileges of the forest, and the assistance of club members in the protection of those remotely situated areas embraced by their activities is gratefully acknowledged.

The whole of the State forests in the Rimutaka, Tararua, and Ruahine Ranges are made use of as sports grounds by nine tramping clubs, and under permits from the Service some fifteen club huts have been built for the accommodation of members. One new one was built during the year on Mount Holdsworth (Tararua State Forest) by the Hutt Valley Tramping Club. These huts are erected under conditions which provide that they are controlled by the clubs but are the property of the Crown. Clubs are also permitted to establish necessary access tracks under conditions which provide for a minimum of damage to the forest growth.

It should be made clear that the establishment of vested rights in State forests cannot be entertained, as only by adopting this policy can the Forest Service reasonably safeguard the forests from damage by fire or vandalism.

4. Commercial Afforestation Companies.

The Service continues to receive from time to time inquiries from overseas investors and others concerning the operations of various commercial afforestation companies in the Dominion. All such inquiries should be directed to the Commissioner of Stamp Duties, Wellington, C. 1.

5. Honorary Forest Rangers.

This report would not be complete without some reference to the assistance the Service receives from its corps of honorary forest rangers. The number now stands at 216. There were 35 new appointments made during the year and 3 resignations were received. These gentlemen have the status of forest officers, *vide* section 10 of the Forests Act, 1921–22, and their services—several of many years standing—are again gratefully acknowledged. Without this voluntary help, principally during the fire season, many remotely situated forests could not be adequately supervised.

APPENDIX I.

SUMMARIZED REPORTS ON STATE AFFORESTATION.

Auckland.

Afforestation in this region proceeded on much the same scale as in the preceding year; under all heads approximately 800 acres were planted with 865,500 seedlings, while another 189,400 trees were used for blanking and reconditioning areas previously planted.

The actual planting period was not entirely favourable, climatically speaking, particularly at Tairua, where dry spells affected the growth of *P. patula* and *P. taeda*, the strikes being only 26 per cent. and 48 per cent. respectively. On the other hand, the strike of *P. palustris* and *P. radiata* was almost 100 per cent. Almost equally good results with these two latter species were obtained at Waipoua, but here again *P. patula* failed to transplant satisfactorily.

In South Auckland a beginning was made with the rehabilitation of the cut-over areas of the pumice country bordering the Main Trunk line south of Te Kuiti, and Waimiha was finally chosen as the centre of future activities, where a small nursery will be installed next year.

Tairua.—As will be seen from an earlier portion of this report, the bulk of the new planting in Auckland was done at this station. From the nursery 834,800 trees were lifted and 334 lb. of seed were sown. New planting accounted for 719,300 trees, interplanting for 86,800, and blanking 2,000, the predominating species being *P. radiata*, *P. palustris*, and *P. patula*.

Operations in advance of planting included burning 878 acres, line-cutting 171 acres, and clear felling 31 acres.

The necessary maintenance to buildings, fences, roads, telephone-lines, &c., was given attention, and firebreaks were cleared where required.

Riverhead.—Heavy winter rains here were followed by a dry spring with further rainfall in early summer and drought conditions during late summer and autumn. Planting was mainly confined to blanking 84 acres, and maintenance-work included painting residence at headquarters, clearing slips on roads, ploughing, burning, clearing firebreaks, &c. Thinning of *P. radiata* stands will soon be necessary. Pruning was carried out on *P. radiata* stands, 310 acres being dealt with, and 127 acres of planted lines were opened up.

Maramarua.—Tree growth of *P. radiata* is making good progress, but the few other species planted are slow in conquering the fern ground cover. In a year or two at longest pruning of all of the *P. radiata* compartments will be necessary. From the nursery 119,500 trees were lifted and distributed, mainly to other stations, and 8,500 one-year-old *P. radiata* were lined out.

Permanent works accomplished were the renovating of the old mess-room and its conversion into quarters to accommodate four men, the metalling of 47 chains of road, and widening and reconditioning of other roads, whilst maintenance covered repairs to roads by removal of slips, replacement of wooden culverts by concrete ones, strengthening bridges, &c., clearing of firebreaks, cleaning drains, and altering and reconditioning telephone-lines. Stands of *P. radiata* totalling 546 acres were pruned.

Waipoua.—Sixty acres of new planting was carried out at this station, and a small area was underplanted. Routine work and maintenance were kept well up to date.

Puhipuhi.—The main work carried out here was routine maintenance; 39 acres were cleared for planting, repairs effected to ranger's cottage, firebreaks cleared and burned, and tracks opened up. An area of 110 acres was exploited for pit props, and 16,000 props were extracted.

Rotorua.

Kaingaroa.—Very little new planting was done during the year, but a total area of 3,800 acres was blanked, 2,920,300 trees, mainly *P. ponderosa* and *P. murrayana*, being used. A subsequent survey showed that the average mortality was about 3 per cent.

Nursery.—Although seed-sowing was commenced on 20th October, unfavourable weather conditions delayed its completion till 7th November; 522 lb. of seed, principally *P. murrayana*, *P. ponderosa*, and *P. strobus*, were sown, which produced a crop of 3,535,000 seedlings. Unfortunately, very bad weather followed seed-sowing, and the *P. ponderosa* and *P. strobus* completely failed to germinate. Further sowings of *P. radiata* (60 lb.), *P. murrayana* (50 lb.), and *P. pinaster* (23 lb.) to replace the losses were made at the end of December, but the result was not satisfactory; the crop was severely affected by high winds, and only 495,600 seedlings survived.

Rotoehu.—The small area of 67 acres was planted with 65,700 trees, mainly *P. taeda* and *P. palustris;* a mortality count showed that about 94 per cent. have survived. Blanking of 44 acres absorbed 14,800 trees, 11,800 *P. radiata* and 3,000 *S. sempervirens*. Nursery seed-sowing commenced about the middle of October, and, owing to adverse weather conditions, was not completed until early in January. Germination was eventually very satisfactory in all species, but storm losses occurring in late January so reduced the crop that only 2,843,500 young trees were raised from 643 lb. of seed, *P. strobus*, *P. taeda*, *P. palustris*, and *P. caribaea* being the principal species.

Tree stocks in all three nurseries in the conservancy total 11,708,000. Of these, 6,239,900 will be held for Service use, 261,200 reserved for Public Works Department, and the remainder carried over till next season.

Thinning was carried out at Waiotapu State Forest, and a total volume of 81,800 cubic feet of wood was obtained, comprising 7,448 posts, 147 strainers, 910 telephone-poles, 8,900 props, 4,721 logs, and 133 cords of firewood.

In the same forest 142,800 cubic feet of timber was cut and removed under contract from an area of 106 acres, detailed products comprising 110,360 mine props, 400 fencing rails, and 30 cords of firewood, to a value of £1,435.

In September, 1938, a small portable sawmill was installed in Waiotapu State Forest and operated for fifty-seven days, cutting mostly 33-year-old *P. radiata* logs. The total output was 362,360 ft. board measure, and this will largely be used for building purposes within the conservancy, the main project being buildings at Waipa in connection with the milling and box making operations which will shortly be commenced there.

Wellington.

Karioi.—This station experienced favourable weather conditions, although the late summer was unusually dry and a strong August gale did damage to double leaders in the four compartments of *P. radiata*. With the exception of a few species on high altitudes, the trees generally have made fair growth.

Pruning operations were carried out over an area of 355 acres of almost pure *P. murrayana* and, owing to the heavy branching habits of this species, pruning saws were found more suitable for the work than the docking saws, slashers, &c., previously used. Tree stocks of all species in the nursery are estimated to number 1,900,000.

Erua.—A further area of 644 acres of cut-over land was planted as follows: *Thuja plicata* (318 acres), *C. lawsoniana* (304 acres), &c. It is estimated that there are 261,000 trees in the nursery available for this year's planting.

Tongariro.—This new project was commenced two years ago on cut-over bush land in the vicinity of Owhango on the Main Trunk line, and during the period under review 619 acres were planted with 392,800 trees similar in species to the Erua planting.

A small nursery has been established in Owhango Township, where there are at present 640,000 lined-out trees.

Nelson.

Golden Downs.—Well-distributed rainfall during the growing season benefited tree-growth of all classes, notwithstanding a dry spell which continued from the middle of January to the end of March. A small planting programme of 368 acres was carried out, the predominating species being *P. laricio*, *P. muricata*, *P. ponderosa*, and *P. murrayana*. Other activities included blanking (374 acres), replanting (553 acres), and interplanting (202 acres).

Pruning and partial thinning treatment was given to an area of 833 acres, the pruning being to a height of from 10 ft. to 14 ft. The stands comprised *P. radiata* and *P. muricata* of the earlier plantings. Tree cleaning covered an area of 1,250 acres. There are 2⅓ millions of trees in the nurseries.

Dumgree.—Routine maintenance-work was carried on throughout the year; 130 cords of firewood cut from poor trees were disposed of to the New Zealand Railways Department. The severe late summer drought, which has always been so harmful to this area, again exacted a heavy mortality toll.

Westland.

The oldest areas of replanted cut-over forest are now fifteen years old and constitute the largest forest of cypress species in the Dominion. In many places western red cedar, Lawson's cypress, and Monterey cypress have now well outstripped the lower story of scrub and second growth in this old cut-over forest, and a dense forest stand has been established of an entirely new type. The crowns of the introduced planted species have, however, not yet closed to a canopy which will kill out the understory, so that the whole of the ground is covered with an impenetrable thicket. Annual height growth of the cypresses is, however, extremely satisfactory in all places where their leaders have pierced the indigenous scrub thicket, and the present stage of the forest is a most interesting and promising one. Opossums, cicadas, and *Armillaria mellea* are all taking their toll, but indications are that, given a consistent campaign against the opossum, the new forest will hold its own against the other enemies.

Of quite a different type is the dredge-tailings area at Rimu, where the only planting was done for the year in the district. This was a mere 5½ acres of Corsican pine, which so far shows an 80 per cent. survival. This type of planting on barren boulder debris from dredging operations has now been in progress for fifteen years also, but, although it attracts much more public interest and commendation than the previous type, its final outcome is still very much in doubt. A distant view of patches of plant cover on an area known to have been bare boulders appears to arouse enthusiasm in the casual observer by reason of the contrast with the still uncovered boulder heaps. Close examination of the trees, however, does not reveal much grounds for hopes of an ultimate timber yield of any moment; and the increasingly popular view that the desolation of boulders left behind a large dredge can easily be turned into a profitable pine forest should not be passed over without this note of warning.

Canterbury.

New planting in this region was confined to some small areas at Balmoral comprising odd corners, patches of swamp, &c. Nursery work was continued on a small scale, and 362,900 *P. radiata* trees were lifted and planted out. Nursery stock available for future planting comprises 688,000 *P. radiata* and 185,000 *C. macrocarpa*. Local seed collection covering five species totalled 483 lb., the greatest quantity being *P. radiata*.

Silvicultural work included clearing, underscrubbing, pruning, and thinning—the latter operation being mainly confined to Hanmer. Firewood, poles, posts, &c., to a total value of £1,324 were extracted and sold from Hanmer State Forest, and 92 cords of firewood to a value of £86 were sold from Balmoral.

During the year the major operation was the construction of new roads and the maintenance and improvement of old ones at Eyrewell and Balmoral for safe and rapid access in case of fire.

Southland.

Afforestation operations comprised mainly minor blanking and the planting with eucalypts of the ash group of an area of 8 acres at Beaumont. This station also accounted for over six hundred deer off planted areas.

At Pebbly Hills 535 acres of trees were cleaned, and extensive road formation was pushed forward at all stations, particularly Conical Hills, Pebbly Hills, and Dusky.

It is interesting to note that at the close of the year the erection of three dwellings and twenty-eight one-man huts had been completed; the building timber, exclusive of the joinery, was all *P. radiata* cut by the Service pilot mill at Tapanui.

A planing-plant was erected here in January, 1939, and immediately commenced dressing timber for weatherboarding, lining, flooring, &c., turning out a quantity of 88,900 ft. board measure of dressed stock before the end of the financial year. The pilot mill commenced working at the end of July, 1938, and finished with a total output of 414,480 ft. board measure, subsequently being dismantled and shifted elsewhere.

The nurseries this year carry 977,000 trees.

APPENDIX II.

LIST OF COMMON AND BOTANICAL NAMES OF SPECIES MENTIONED IN THIS REPORT.

1. Indigenous.

(*a*) *Softwoods :—*

Kaikawaka (*Libocedrus bidwillii*).
Kauri (*Agathis australis*).
Matai (*Podocarpus spicatus*).
Miro (*Podocarpus ferrugineus*).
Rimu (*Dacrydium cupressinum*).
Silver-pine (*Dacrydium colensoi*).
Totara (*Podocarpus totara*).
White-pine (*Podocarpus dacrydioides*).

(*b*) *Hardwoods :—*

Beech (*Nothofagus* spp.).
Rata (*Metrosideros* spp.).
Red beech (*Nothofagus fusca*).
Silver beech (*Nothofagus menziesii*).
Tawa (*Beilschmiedia tawa*).

2. Exotic.

(*a*) *Softwoods :—*

Corsican pine (*Pinus laricio*).
Douglas fir (*Pseudotsuga taxifolia*).
Insignis pine (*Pinus radiata*).
Japanese cypress (*Cryptomeria japonica*).
Larch (European) (*Larix decidua*).
Lawson's cypress (*Cupressus lawsoniana*).
Loblolly pine (*Pinus taeda*).
Lodgepole pine (*Pinus murrayana*).
Longleaf pine (*Pinus palustris*).
Maritime pine (*Pinus pinaster*).
Monterey cypress (*Cupressus macrocarpa*).
Norfolk Island pine (*Araucaria excelsa*).
Redwood (Californian) (*Sequoia sempervirens*).
Slash pine (*Pinus caribaea*).
Spreading-leaved pine (*Pinus patula*).
Western yellow pine (*Pinus ponderosa*).
Western red cedar (*Thuja plicata*).
White-pine (American) (*Pinus strobus*).

(*b*) *Hardwoods :—*

Australian hardwoods, principally *Eucalyptus* spp.
Mountain ash (*E. regnans*).
Oak (*Quercus* spp.).

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