1941.

NEW ZEALAND.

STATE FOREST SERVICE.

ANNUAL REPORT OF THE DIRECTOR OF FORESTRY FOR THE YEAR ENDED 31ST MARCH, 1941.

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, 18th July, 1941.

I have the honour to present herewith, pursuant to section 64 of the Forests Act, 1921–22, the annual report of the operations of the State Forest Service for the year ended 31st March, 1941.

I have, &c.,
ALEX R. ENTRICAN,
Director of Forestry.

Hon. Frank Langstone, Commissioner of State Forests.

CONTENTS.

REPORT.

SUMMARY.

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

State Forests.—The area under the control of the State Forest Service is now 8,762,000 acres, of which 6,676,700 acres are permanently reserved ; the net increase for the year was 311,548 acres. The percentage of land area under forest reservation has risen to 13·20.

Exotic State Forests.—Tree-planting was continued on a very minor scale, 4,223 acres being planted, which brings the total area under trees to 439,804 acres.

Forest Fires.—Excepting one serious fire in Eyrewell Exotic State forest, North Canterbury, when over 1,000 acres of young trees were destroyed, the fire hazard generally was low, and although numerous small fires were reported, the actual damage was negligible.

Timber Sales.—The quantity of timber sold was nearly 17,000,000 board feet greater than last year's total, the actual figure being 94,134,000 board feet.

Timber-production.—The increase in the timber produced from State forests was, however, not nearly so marked, being approximately 500,000 board feet in excess of the previous total of 112,000,000 board feet. The total quantity of timber produced from all sources is not yet definitely known, but it is expected to aggregate 340,000,000 board feet—the previous year's cut was 336,000,000 board feet.

Sawmills.—A reduction in the number of sawmills from 598 to 585 was recorded as at the end of the financial year ; of this number, 319 worked full time, 123 worked part time, while 143 were closed down ; 435 mills cut indigenous timber only, and 92 worked exclusively in exotic forests.

Imports of Timber.—As was to be expected, a sharp decline took place in timber imports, and the total quantity as recorded by the Comptroller of Customs at the 31st December, 1940, was 15,000,000 board feet, or slightly more than one-third of the total for the previous year. The value of these imports was £298,600.

Exports of Timber.—On the other hand, exports of timber increased by over 4,000,000 board feet in quantity and £43,000 in value ; the actual total was 17,408,000 board feet, valued at £195,400.

Rehabilitation.—Preparatory plans for the rehabilitation of ex-servicemen have received close attention, and much preliminary work has been done in collaboration with other State Departments.

CHAPTER I.—FOREST POLICY.

Section A.—Personnel and Planning.

1. The New Zealand State Forest Service is rapidly attaining a full wartime footing. As never before, war has reduced all forest issues to one simple problem, that of meeting an increasing and ever-changing demand for timber. Month by month this has claimed more and more of officers' time until in some instances their peacetime activities have been reduced to a vanishing point. To conserve manpower, continuation of this trend is inevitable, and the Department's programme of work is being reoriented accordingly.

Fire protection, timber appraisal, and utilization activities with their direct contribution to essential wartime production have been intensified, but with two exceptions all other activities either have been or are in course of being reduced to a mere skeleton basis. The two exceptions are staff training and planning, upon which the whole resources of the Department surplus to the war effort must be concentrated. Prior to the appointment last year of additional technically-trained personnel and their assignment to silvicultural and forest-management duties, it was realized that more particularly in the State exotic forests some losses must be anticipated due to haphazard planning and lack of trained staff over a long period of years. Even prior to the great depression, organization and personnel were entirely inadequate to the Department's rapidly-increasing responsibilities, and both the depression and post-depression periods have served to accentuate the disparity between volume of essential work and available trained staff. The seriousness of the position can no longer be ignored, and any attempt to correct it merely by intensification of current training methods must fall far short of minimum requirements.

2. Military service obviously precludes the training of an adequate junior technical staff until the conclusion of hostilities, when it is hoped that a number of scholarships in overseas Universities will enable forest officers now on military service to qualify for professional duties. In the meantime it is hoped to arrange a number of staff exchanges with overseas forest authorities so that certain technical officers may obtain a practical working knowledge of our principal exotic species in their natural habitats and that at the same time New Zealand may receive the benefit of similar knowledge possessed by the exchange officers.

With improved staff-recruiting arrangements now in operation, it becomes practicable to supplement the ordinary attachment method of field training for ranger officers by providing full-time instructional facilities at a Forest Ranger School. An ideal location exists at the Whakarewarewa State Forest, to which large areas

of both indigenous and exotic forest are contiguous, and consideration is being given to the details of such a scheme. Only by the immediate inauguration of such a scheme will it be possible to provide the trained field staff required to overtake the accumulated deficiencies in personnel to enable the Service to function efficiently and economically and to discharge adequately its responsibilities in connection with war, rehabilitation, and peacetime activities.

Section B.—Indigenous Forests.

3. The ever-increasing difficulty of locating new and accessible forest areas for cut-out mills is emphasizing the necessity for a nation-wide appraisal of the indigenous forest resources. The value of the general forest inventory carried out over the 1921–25 period was limited by the reconnaissance nature of the work upon which it was based. Its greatest usefulness was in demonstrating beyond all possible doubt the necessity for establishing a capital forest resource of exotic softwoods which would supplement declining supplies of native timbers until such time as the indigenous forests could be brought into full productivity.

What is now of vital importance is the organization of immediate future supplies for the industry not so much for the war period as for its aftermath when demand is likely to expand on a considerable scale. A five-year programme of forest development for both the kauri and white-pine sections of the industry has already been prepared, and a survey of standing rimu supplies is now in progress with a view to organizing an orderly development of this section of the industry over the 1941–48 period. With a contracted staff this appears the only possible wartime contribution to a national appraisal of the Dominion's indigenous resources.

4. While the basic objective of bringing all remaining major forest areas under working-plan management is an essential feature of these development plans, this is not to be interpreted as any desire to create opportunities for only large producing units; rather the reverse, in that the purpose is to spread such standing-timber supplies as are available on major forest areas over as long a period as possible, preferably until either younger trees or planted exotics may be harvested. It is a matter for regret that many of those interests already possessing substantial supplies of standing timber by way of either freehold or cutting rights show little if any disposition to manage them on a similar basis, and their failure to conserve these assets cannot but prejudice future applications for timber from State forests. Indeed, the position must soon arise, if it has not already arisen, when consideration should be given to the control of cutting practices on privately-owned forest land with a view to conserving supplies and keeping the land reasonably productive, not ignoring the cogent objective of maintaining an effective vegetative cover in the interests of counter-erosion.

5. One aspect of the soil-erosion movement constitutes a serious threat to the success both of the general forest policy and to the future development of the sawmilling and allied forest industries. As the more accessible forests are logged and mills move further and further into the hinterland, ardent but unobserving conservationists clamour more and more for a halt to this movement and a lock-up-keep-out policy of reservation for the more inaccessible forests. Extremists have even advocated the limitation of milling operations to country below an altitude of 1,000 ft. above sea-level.

Too often the effects of abnormal climatic and seismological disturbances are mistaken for those of milling operations, and enthusiastic conservationists when faced with overturned trees and recently-killed standing timber in the vicinity of mills attribute the damage to logging operations. Doubtless they harbour in their minds memories and traditions of the grim cut-over-burnt-over areas of a former pre Forest Service era. Now, with effective fire regulations and control, forest fires even in logged-over areas have been a rarity for twenty years. It really takes an expert immediately after logging to distinguish even at a remarkably short distance the actual logged area from the surrounding untouched forest. Actually walking through the forest at this time the logged areas are, of course, easily discernible by snigging tracks, by freshly-cut stumps and heads, and by small patches of crushed undergrowth, but the soil-stabilizing value of the forest remains unimpaired, and within the space of a few years all blemishes have disappeared beneath the invasion of the forest undergrowth. Common-sense will prevail if it is remembered that often not more than five and seldom more than fifty trees out of several hundreds are actually logged per acre.

6. Of paramount importance is public recognition of the fact that by far the bulk of the virgin forests are completely unproductive in that trees are overmature and that any new growth is more than offset by decay, but that the very logging operations and abnormal climatic and seismological disturbances which are of such concern to the conservationists actually create conditions favourable to the re-establishment of a new crop and thus restore the forest to some degree of true productivity. Recent outstanding instances are the 1937 gale which uprooted many trees in the southern half of the North Island and the 1939 salt-laden winds which killed so many trees throughout the greater part of the North Island. Much of the damage done by these winds has been wrongly attributed to logging operations, and in quite a number of the affected forests a young growth of beech, white-pine, &c., now flourishes where windthrown trees originally exposed the mineral soil and seeded in a new tree crop.

Conservation as applied to forestry has been defined as the preservation of forests by wise use, and with counter-erosion and watershed values unimpaired and forests restored to productivity, logging of upland forests under Forest Service supervision constitutes both a logical and indispensable element in the national forest effort. Its real significance lies in the fact that the major objective of the forest policy—that of supplying the Dominion with the bulk of its timber requirements—can only be achieved by bringing every acre of forest land into maximum productivity and by having available the entire standing-timber resources of the indigenous forests, even if this ultimately involves regulation of cutting on private and other lands.

It is therefore in a double sense that upland stands are referred to as protection forests, since the objective of their management is the protection both of their productivity and of their counter-erosion and watershed values as well, incidentally, as of their recreational facilities. Only by the integrated use of the upland forests for all purposes may the maximum economic and social values, both direct and indirect, be derived by the public. Extension of the State forest estates to achieve this is a corollary.

Section C.—Exotic Forests.

7. A grave warning was issued in the last annual report as to the poor condition of both private and State exotic forests and the necessity for avoiding any repetition of the contributing factors. While interim experience has served to confirm the worst fears in respect to faults of establishment—wide espacement, choice of wrong species and sites, general location, &c.—the indications are that no less trouble is likely to arise through long-continued neglect of silvicultural operations. Both threaten the health and vigour of many stands, some of which may be affected to such an extent as to become potential focal points for widespread insect and fungal attacks of an epidemic character, and others in such a manner as to preclude both cheap logging and cheap and quick re-establishment by natural regeneration, thus necessitating slower, more costly, and less effective re-establishment by planting.

8. Every corrective within the power of the Department is being applied as rapidly as personnel and funds will allow. The position during the year has improved in that for the first time in the history of the Department the services of a technically-trained personnel have been available to plan and initiate a vigorous attack upon exotic forest problems. With each succeeding year a material improvement should accrue, more especially as additional experienced officers become available in accordance with the training scheme already outlined. The necessity for long-term financing to ensure silvicultural treatment at appropriate times, irrespective of the general buoyancy or otherwise of the country's general finances, should be obvious. In the ultimate analysis, silvicultural treatment is no less essential to the continued functioning of the forests than the regular supply of oil and grease to hydro-electric turbines. Admittedly silvicultural operations are relatively much costlier, but the time required to effect the repair of a worn-out bearing is almost infinitesimal when compared with the time required to repair the damage to a forest caused by lack of silvicultural treatment at the appropriate period.

9. Arising from the disclosed condition of the exotic forests, the continued contraction in estimated future supplies of exotic timber, more particularly in the form of sawlogs, lends additional support to the policy advocated last year of establishing relatively small exotic forests in poorly-timbered districts. A number of promising areas have already been examined, and there is little doubt that these offer much more promise as an economic source of timber-supplies than the large tract forests of the North Island hinterland. Not all districts, however, are suited either by climate or by soil for the creation of exotic forests. Too often the existence of relatively high-quality indigenous forests is assumed as a favourable index of good exotic-tree growth, whereas the reverse sometimes operates. Typical limiting factors are the relatively low altitudes and well-drained soils required by exotics as compared with the high altitudes and poorly-drained soils occupied by many indigenous forest associations, and it is for these reasons that exotic-forest activities in Westland must be confined to the relatively small areas favourable to their success. On the other hand, Westland is the one district in New Zealand which offers hope of widespread success for sustained yield management of the indigenous forest, thereby ensuring the continuity of the timber industry, an objective which is entirely impracticable by exotic-afforestation measures alone.

Section D.—Integration of Indigenous and Exotic Forests.

10. Equally disturbing as the contraction in estimated supplies of exotic sawlogs is the relatively poor quality of such supplies as are available. Whilst some improvement is being effected by the intensification of pruning-work, the effect of the initial mistakes in espacement and choice of sites is inescapable for generations, and the percentage of timber reasonably free from defects and suitable for finishing purposes in the building, furniture, and other trades will probably constitute but a very few per cent. of the total exotic saw timber production. In contrast, the yields from indigenous virgin timber vary in many forests between 30 per cent. and 50 per cent. of the total cut, and it is upon such percentages that the whole wood-use philosophy of the country is based.

With rapidly-declining supplies of virgin timber, some economy, therefore, appears essential, otherwise the major objective of supplying the Dominion timber requirements will be defeated by a serious deficiency in defect-free timber, coupled with a surplus of low-grade material. Although at present the whole of the exotic-softwood production is absorbed for boxing, crating, and constructional purposes and surplus future production will be eagerly sought after by Australia as a wartime and post-war substitute for North American hemlock and spruce, the time must come when supplies in excess of these demands will become available for local consumption. It is therefore imperative that in the interim every conceivable avenue of economy in the use of the indigenous timbers should be investigated with a view to integrating the utilization of the indigenous and exotic timbers as effectively and as rapidly as possible. The whole gamut of New-Zealand-grown woods must be studied—indigenous and exotic, softwood and hardwood, poor-quality material and high-quality material—all to find a place in the country's wood-use economy.

The plywood and laminated-wood industries are amongst the most promising developments for economizing high-quality material, and their current expansion will ultimately make a noteworthy contribution to the country's wood economy. At the other end of the scale the fibreboard and pulp and paper industries offer an outlet for poor-grade material. Substantial as the contributions by these industries may be, the sawlog is still the major product of the forest, and the balanced absorption of its entire timber yield by the building and constructional industries remains the basic problem of forest utilization. To its solution the energies of the Department are directed.

Section E.—Forest Finance.

11. The need for an adequate programme of forest finance to meet the requirements of a ten-year period becomes increasingly apparent each year; past experience shows that forestry will play an important part in the rehabilitation of the men from the fighting Services, and to function effectively the Service must be fully

assured of stable finance to maintain reasonable supplies of tree seed, tree stocks of various ages, land, equipment, and trained personnel over a long period. Possibly even more important is the ability which funded finance provides to put into operation both a regular silvicultural programme at the times when age and condition of stands demand it, and emergent salvage programmes at short notice when sudden storms, epidemics, fires, or other mischances render necessary cleaning-up measures that could not have been foreseen. The lack of any one of these essentials will cause serious delays, if not a complete breakdown, in any large-scale programme of forestry works for rehabilitation purposes.

The much-discussed interest question was reopened with the Treasury during the year, and that authority has concurred in the recommendation from the Forest Service that forest operations should be relieved of interest on expenditure, past as well as future. The Service has long contended that, as national forests are fundamental to the well-being of the community, and as this country was originally well forested, one of the first charges upon the revenues from the harvesting of the original stand should have been reasonable reafforestation.

Unfortunately, from most of the original forest stand cut in the first half-century of settlement, little if any timber revenue was collected; and when gradually small dues were collected by the Crown from sales of Crown timber, the major portion of the revenues was still allocated to general territorial revenue only, instead of being earmarked for replenishment of the forest estate. When afforestation was begun, moneys for such work on a large scale were then secured by loans, with the result that interest on such loan advances would be capitalized and compounded during the life-cycle of the forest and would reach fantastic figures. The interest-rate decided upon and compounded was $4\frac{1}{2}$ per cent., which meant that in, say, a rotation of fifty years £1 initial expenditure would become £8 merely by the addition of interest. This deferment of reckoning and acceptance of a "cost" valuation inflated by compounding interest over such long periods can only be considered as unsound national finance. In short, had the accumulated revenues from the original stand remained available for forestry purposes, a replenishment fund would have existed from which all such advances could have been made and could have been effected free of interest. As these revenues were used for other purposes, they should be replaced from funds held for general purposes.

The Service has also under consideration the proper management of high-country areas for prevention of erosion, and as this question is of definite national benefit, funds required should be obtained from the Consolidated Fund and should not be treated as part of the normal expenditure from the State Forests Account as at present constituted.

Section F.—Soil Erosion.

12. The Forest Service continues to advocate a realistic approach to the problem of soil erosion through Dominion-wide control of land-burning operations. No other measure can give such effective results either as quickly or as economically. A conservative estimate of its effectiveness is placed at 80 per cent. of the theoretical maximum. So aggressive is the New Zealand vegetation that no ground is too barren to resist its invasion—that is, if burning is controlled. Too often observation of erosion is limited to pastured slopes heavily scarred or even deeply gullied without realizing that every forest-clad hillside bears scars and gullies, though many are so healed by the ever-invading vegetation as to defy casual detection. But whereas repeated and uncontrolled burning aggravates and perpetuates the one, controlled use of fire arrests and heals the other. Even much of the harmful effect attributable to overgrazing is a direct result of indiscriminate burning and would therefore be corrected by control of firing operations. Simple as the premise is, it provides the most practicable and economic method of preventing accelerated erosion.

CHAPTER II.—ADMINISTRATION.

Section A.—Permanent and Temporary Staff.

13. The work has imposed an even greater strain on many members of the staff than was the case during the previous year. This was due mainly to an increase

in volume of timber-control activities brought about by the war emergency and to the constant changes among the personnel necessitated by the calling-up of officers for military service overseas and in Territorial units. In consequence it has been found necessary, in common with other branches of the Public Service, to replace many experienced officers by untrained temporary employees, with the result that much added responsibility has been cast upon senior officers. Similar difficulties are being met with at the sawmill and box-factory at Whakarewarewa, which came into production during the year. Owing to the large numbers of experienced bushmen and sawmill hands of all categories who are now on active service overseas, an ever-increasing difficulty is being experienced in procuring and retaining a full staff of trained operatives. Nevertheless, despite the many difficulties encountered, members of the staff have given of their best. Some have had to work extremely long hours to meet the constantly-recurring emergencies of a war period, but one and all have cheerfully accepted and performed such duties as a humble contribution to war service.

The permanent staff was increased from 176 to 193. Of the 17 new appointments, 1 was clerical, 2 were technical trainees, and 12 were cadets, 4 of these being supernumerary cadets required to fill vacancies occurring in the junior ranks through the calling-up of young officers for military service. The only important appointments were a Check Appraisal Officer and an Assistant Accountant at Head Office, the former to supervise and check the ever-increasing amount of timber-cruising work and the latter to cope with the additional work arising out of the general expansion of departmental activities. As mentioned in the last report, more permanent officers are required to meet the rapidly-growing demands of the Service, but the filling of the more-important positions will have to await a return to more settled conditions.

The positions of Conservator of Forests in Southland and Westland (two first-grade conservancies), rendered vacant by the appointment last year of a Senior Working Plans Officer at Head Office and a Senior Utilization Officer to supervise logging, milling, creosoting, and factory activities at Rotorua, were filled by the promotion of the two second-grade Conservators at Nelson and Christchurch respectively, the consequential vacancies in turn being filled by the promotion of two Senior Rangers. The Conservator of Forests in Westland was appointed to command the 15th Forestry Company (New Zealand Engineers) for service overseas, and this required the temporary appointment of a Senior Ranger as a Conservator.

To carry on the work of officers absent on military service, to provide for increased timber-control activities, and to establish a supervisory foreman personnel for the expanding utilization work of the Department, the temporary staff was increased from 99 to 116.

14. The response to the call for military service has been excellent: 31 officers are serving with the Army overseas, 16 are attached to Territorial units, 6 are serving with the Air Force, 27 are in the National Military Reserve, and 81 in the Home Guard and E.P.S., making a grand total of 161 officers, or over 50 per cent., of the total permanent and temporary staff on some form or other of military service.

Section B.—Casual Staff.

15. The average monthly casual staff of conservancies was 1,194, as compared with 1,399 for the previous year. During the year a large number of the casual employees in the North Island conservancies were drafted to farm employment and, combined with voluntary enlistments and the calling-up of men for military service, resulted in the total number gradually falling from 1,362 at the commencement of the year to 1,074 as at the 31st March, 1941. The Rotorua Conservancy, the largest employer, suffered most in this respect, the numbers falling from 617 to 378, the monthly average being 468, or 39 per cent. of the total, as compared with 51 per cent. for the previous year. The longer the war continues the greater will be the difficulty experienced in obtaining men capable of undertaking forestry work, which calls in most instances for a high standard of physical fitness.

Section C.—Honorary Staff.

16. As on previous occasions, acknowledgment is made of the valuable service rendered to the Department and the cause of forestry generally by the honorary Forest Rangers, who devote so much of their time to the protection of the forests. Only those imbued with a natural love of the forest and a high sense of public duty could give their time so ungrudgingly to this work. The total number of the honorary staff is now 235, 17 new appointments having been made and 8 resignations received since last year.

Section D.—Health and Safety of Employees.

17. The health of the staff has been kept regularly under review by both departmental Inspectors and the Staff Committee. Staff changes made last year in the interest not only of officers but also of their families have proved beneficial to the Service, and further staff changes both in location and in duty will conserve the health of officers and improve their efficiency.

18. The Safety Committee met at regular intervals to consider what measures should be taken to impress upon employees the necessity for taking all possible precautions to prevent accidents. Contacts were made with other Forest Services, industrial undertakings, and Safety Councils at Home and abroad, and much valuable information was secured. In addition to provision for the protection of all moving parts of machines, slogans and illustrated posters depicting the dangers to be avoided when operating certain types of machines were prepared and distributed. Amongst other matters dealt with were the provision of suitable headgear to protect workmen from falling branches and cones whilst tree-felling in exotic forests, and the protection of men employed at the sapstain bath from the action of the chemicals used.

I regret to record one fatal accident during the year, but apart from this the position generally has been satisfactory. Of the 229 accidents recorded, cuts accounted for 70, or 30 per cent. of the total; crushes and bruises 48, or 21 per cent.; strains 55, or 24 per cent.; eye injuries 26, or 11 per cent.; and septic wounds 15, or 7 per cent.; leaving miscellaneous 15, or 7 per cent. Expressed in terms of the average monthly casual staff, the accidents represent 19 per cent., as compared with 18 per cent. last year, but both figures show a distinct improvement on previous years.

Section E.—Compensation to Employees.

19. The Service is continuing its policy of carrying its own accident-insurance risk, and the wisdom of this practice is amply demonstrated by figures set out below:—

Year.	Total Payments.	Total Wages.	Per Cent. (Approx.).
	£	£	£ s. d.
1939–40	1,979	282,388	0 14 0
1940–41	4,470	276,000	1 12 6

For the past year the estimated premium payable for a comprehensive accident policy would have been £8,570; a saving of over £4,000 has thus been effected.

Section F.—Recruitment and Training of Staff.

20. This problem has been given constant study during the year. The recruitment and training of technical staff is closely allied to and in many cases overlaps the problem of the provision of executive or General Division staff. Though there are many aspects of this matter which are controversial, there is one point that admits of no dispute. Since the closure of the University Schools of Forestry, the onus of training technical foresters must devolve upon the State Forest Service, as the only forest authority in the Dominion. During the past year, therefore, an attempt has been made to begin a system of training which will ensure that the staff of the future will secure a formal scientific training, as distinct from the departmental training and experience that naturally ensues from work in the Service.

One staffing difficulty in the past has been that, whereas secondary education to Matriculation or post-Matriculation standard has opened the way to cadetships and subsequent higher formal qualifications in the Clerical Division or, in more limited numbers, in the Professional Division of Public Service classification, it has not assisted would-be recruits for the General Division, which forms the backbone of the Forest Service field staff. There has, in point of fact, been no such rating as cadet, General Division, and hitherto recruitment for the field staff has been mainly from the ranks of the daily-wages men, those showing keenness and a special aptitude for the work being appointed to the temporary staff and later, in certain cases, to the permanent staff, but many of them either for educational or other reasons have been unable to advance beyond the Junior Ranger class.

With the approval and assistance of the Public Service Commissioner and his staff, this, the gravest deficiency in the recruitment of field personnel, has been provided for by the granting of permission for an increased recruitment of General Division trainees of satisfactory educational attainments, on the understanding that each appointee will get the opportunity of trial in general field-work to test both his suitability and his personal preference for such work as against the normal clerical career to which the Clerical Division cadetship would usually have led him. In addition to this, professional trainees have been recruited for regularized training in science courses, including both those fundamental to forestry and specialized careers ancillary to forestry. These recruits will be stationed during University-session months at the Forest offices of University centres and will be given the same opportunities as are afforded to all other Public Service cadets to attend University classes in subjects cognate to the work on which they are engaged. In University-vacation months they will, so far as possible, be posted to field stations where they may hope to secure an insight into the application of their formal studies to practical forest work. The novel point in this arrangement is the extension of the clerical cadetship recruitments to enable an appointee to find out his true personal aptitude or preference. Recruits will have the choice of three careers :—

(*a*) To pursue the normal clerical and accounting studies of a Clerical Division officer, with a view to following a clerical and ultimately an administrative career in any Department of the Public Service.

(*b*) As technical trainees to qualify for professional status if their proclivities and abilities lead them in the direction of a University degree in science.

(*c*) As field trainees in the General Division to secure experience in practical forestry work. The further studies of this group will be controlled by the Departmental Efficiency Examinations held under the ægis of the Public Service Commissioner.

21. An appeal is being made to secondary-school and University authorities to interest students in the possibilities of forestry as a career both professional and otherwise: Forestry is now on the threshold of a marked expansion which will bring with it increased opportunities for both professional and field work and to specialize in ancillary activities. Botany, mycology, entomology, even physics and chemistry, surveying, engineering, economics, and law are all specialized branches of forestry in which attractive openings are developing for those with a flair for such subjects combined with ambition and a suitable physique.

22. The examinations held for officers of the General Division under the Public Service Commissioner were continued. Of the 1939 candidates, the three who passed the written test completed their practical examination: one was awarded a pass with merit. In the 1940 series there were nine candidates for the Junior Examination and four for the Senior Examination.

23. In accordance with the policy enunciated last year, all staff changes have been effected with a view to widening and completing the experience of officers as early in their careers as possible. The Staff Committee has now completed experience schedules for all officers and initiated training schedules, those for field trainees covering six years and those for professional trainees seven years.

CHRISTCHURCH, N.Z.

Section G.—Staff and Office Inspections.

24. Frequent inspections of regional field activities have been carried out, particularly of timber-cruising work, but fewer office inspections were made owing to pressure of other work. With the reorganization of Head Office staff and the appointment of an Assistant Accountant, it was anticipated that a greater share of the Accountant's time would be available for inspectional duties, but this was not possible owing to many staff changes and an increase in the volume of work at Head Office. The position will be remedied as early as possible.

Section H.—Modification of Executive Charges.

25. No changes in the boundaries of conservancies were made during the period. Those made last year by an interchange of territory between the Rotorua and Wellington charges have been justified by subsequent experience, the Gisborne territory in particular proving much easier to administer from Rotorua than from Palmerston North.

Section I.—Relations with other Departments.

26. With beneficial results, the usual routine inspections of accounts and stores were carried out by the Audit Office Inspectors, while staff inspections were made from time to time by Inspectors from the Public Service Commissioner's Office. Disclosed weaknesses in accounting, stores, and other practices—all of a minor nature—have been duly corrected. In matters affecting the purchase of stores and equipment, reference should be made to the assistance received during a very difficult period from the Stores Control Board, the Post and Telegraph Department, and the Public Works Department, which constitute the authorized purchasing agencies for all Government Departments. A cordial relationship has been maintained with the Lands and Survey Department, particularly in reference to matters affecting soil erosion and scenic preservation. Co-operation has continued with the Native Department in the administration of Native timber sales.

CHAPTER III.—CONSTITUTION OF STATE FORESTS.

Section A.—Changes in Area.

27. The progress of land classification in the Dominion is reflected in changes in the area of State forest, a total of 314,453 acres being set apart as permanent and provisional State forest and 2,905 acres withdrawn from reservation—a net increase of 311,548 acres. The State forest area now totals 8,762,079 acres, or 13·2 per cent. of the total land area of the Dominion. The details of these changes are recorded in Appendices I and II.

Sixteen areas were withdrawn from reservation, all for settlement purposes. Of the total area of 2,905 acres, 2,554 acres, representing almost 90 per cent., were in Westland. The additions—314,453 acres—were spread over all conservancies, the most important areas being in Westland (151,676 acres), Wellington (83,621 acres), and Canterbury (53,168 acres). Of the total, protection forest comprised approximately 94 per cent., virgin milling forest 3 per cent., open land for exotic afforestation projects 2 per cent., and open and forested lands for forest management purposes 1 per cent. The protection-forest areas are located mainly in Westland, Wellington, Canterbury, and Nelson Conservancies, the virgin milling forest mainly in Westland and Auckland, the afforestation areas in Nelson and Rotorua, and the forest-management areas in Auckland and Southland. The areas of milling-timber being largely provisional State forest will, where the land is suitable, be made available for agriculture after the merchantable timber has been removed. An area of 20 acres in Canterbury Conservancy was donated for State forest purposes and a caretaker's cottage site acquired by exchange.

Section B.—Changes in Status.

28. Areas of provisional State forest permanently reserved aggregated 335,555 acres for the year, and with the exception of 514 acres is located in Westland Conservancy. It comprises both protection and milling forest unsuitable for farming, and brings the grand total of permanent State forests to 5,676,727 acres, or 64·8 per

cent. of the total State forest area of 8,762,079 acres, making a strong contrast with the 1921 figures of 1,668,319 acres, or only 24·5 per cent. of the total of 6,802,970 acres. The progress of this change is strikingly set out in Appendix II.

CHAPTER IV.—FOREST MANAGEMENT.

Section A.—Surveys.

29. Topographical surveys covering 6,516 acres were completed—4,300 acres by plane table and the balance by the grid system; 2,817 acres were subdivided into compartments for forestation purposes. For timber appraisals, 154 areas totalling 22,049 acres were surveyed, while the reconnaissance of 3 areas covered 1,679 acres. Tramways 51 miles in length, and roads totalling 32 miles, were also surveyed. Aerial survey work was completed over three small areas totalling 3 square miles; incomplete work comprises one area partly photographed, one to be rephotographed, and two not yet commenced; atmospheric conditions over these latter areas were not conducive to good photography. (Appendix IV).

30. Mapping resulted in 2 new topographical maps of afforestation areas (Kaingaroa and Ashley). One privilege map and 20 operational maps were added to the permanent forest atlas, while 5 stock maps were renewed, and additions made to 48 stock, topographical, and operational maps. For general use, 54 copies of these maps were prepared.

Entries in the forest registers totalled 178, these being made necessary by Proclamations, &c., affecting the status of 317,358 acres of land. The recording of this total area and of various privileges required 1,832 additions to the forest atlas; and for various purposes 241 plans and 848 tracings were prepared, 836 lithographs, &c., coloured, and 264 plans mounted. In the preparation of 230 licenses and 446 permits a total of 2,474 diagrams were drawn, while 17 honorary Forest Ranger's certificates were engrossed, 18 atlas sheets renewed, and 882 photostat prints and 2,352 helio prints prepared, 1,894 of the latter being the work of other Departments.

The total number of recorded photographic negatives is now 15,336, of which 518 were added during the year.

Section B.—Forest-management Staff.

31. The shortage of trained staff has continued, and only four officers were available for the preparation of working plans. Silvicultural activities and utilization duties arising from the war emergency have occupied a good deal of the time of these officers, thus contributing to delay in completion of working-plan reports. A fifth officer, however, was appointed towards the close of the year, while two junior officers were appointed as assistants to the working-plans officer for Rotorua Conservancy. These three appointees are in the Forest Ranger division, but have had the benefit of some degree of professional forestry-school training. Provision was made for the training of forest cadets in working plans and silviculture.

Section C.—Preparation of Forest Working Plans.

32. Due to staffing limitations and pressure of emergency duties, it was not possible to complete the preparation of any working-plan reports, with the exception of one for controlling kauri-cutting in State forests. As the latter embraces all kauri-bearing State forests, and the Forests Act limits the operation of each forest working plan to an individual State forest, the plan prepared will function as a departmental control plan prescribing the allowable kauri cut in State forests. A working plan proper in respect of a kauri State forest of a total area of 30,450 acres was in course of preparation at the close of the year.

Analyses of production and markets have revealed that kauri-production from private forests is now falling so suddenly as to restrict forcibly the utilization of kauri timber to essential uses. In the past, kauri timber was, of course, utilized very largely for general purposes, and in addition considerable areas of kauri forest, large in the aggregate, were destroyed by fire. Although the remaining State forests constitute virtually only remnants of the original kauri stands, it is anticipated

that, particularly if they are extended by the acquisition of lands of other tenures bearing young kauri stands, they will be capable of producing in perpetuity an annual cut of almost 2,000,000 board feet of kauri timber that will be sufficient for essential uses.

Preliminary work on the control of cutting in certain podocarp forests was undertaken with the objective of so controlling the cut that regeneration will be encouraged, that timber production will be regularized over a definite period, and that more efficient utilization will be secured. Completion of this work is urgent in order that suitable areas for milling on properly-planned lines may be available at the conclusion of hostilities.

The five exotic forests in respect of which working-plan preparation was in progress a year ago are of an average area exceeding 6,000 acres, and when it is remembered that they are the longest-established State exotic forests, with numerous sub-compartments comprising experimental plantings, both pure and in mixture, it will be realized that finalization of working plans cannot be quickly achieved under existing staffing conditions. In some instances resubdivision of the forest into compartments of convenient working size has had to be effected. Thus one forest, with sixty compartments of an average productive area of 130 acres ranging from 11 acres to 440 acres, was resubdivided into thirty-nine compartments with an average productive area of 205 acres ranging from 100 acres to 320 acres. Such a revision is only possible after careful examination of topography, working access, and distribution of age classes. In Whakarewarewa Forest, the amassing of field data relating to timber quantities, increment, soil qualities, and ground vegetation was completed, and compilation of the working-plan report is progressing. In the remaining four exotic forests the work has been advanced at a satisfactory rate under present conditions. During the year it was found that in certain exotic forests gaps occurred in historical entries as to forest treatment, &c., in the compartment registers. This was due largely to changes in staff, and steps were taken to ensure that the gaps were filled.

It may here be mentioned that had working plans been put into operation before the war, several variations would have been necessary owing to war demands for exotic-pine timber and even for kauri timber. Such variations in permissible cut and permissible area of cutting are, of course, inescapable in wartime.

CHAPTER V.—SILVICULTURE.

Section A.—General.

33. Extension of areas under productive forest crops, and tending of existing crops to maintain their vigour and productivity, were hampered by the amount of labour available. This is but natural during wartime, but the vital importance of giving tree stands the benefit of silvicultural treatment at the proper time cannot be overstressed. Recent work in complete exploitation of stands which had been left untended since planting has proved conclusively that lack of silvicultural attention during the life of a stand materially increases the actual logging costs of the final crop, in some cases by as much as 1s. per 100 superficial feet, of the utilizable crop—equivalent to over £20 per acre. Thus even if one accepts the common though fallacious argument that neither health nor volume of a stand suffers from lack of thinning during a short rotation, there still remains the incontrovertible fact that direct monetary loss accrues from the unnecessarily costly logging of the final crop if the stand has been fully stocked.

Section B.—Natural Regeneration.

34. Extraction by the Service of kauri logs from State forests under preliminary management is done by caterpillar tractors, and, indeed, this is now the commonest mode of extraction in the kauri forests as a whole. This is already proving of more assistance to natural regeneration of kauri (as well as other species) than the old methods of hauling kauri logs by jacking and rolling logs, by bullocks, and by steam winches. Besides reducing the dense tall ground cover of kauri-grass (*Astelia*),

cutty-grass (*Gahnia*), &c., and pulping it into a condition in which it soon decomposes for humus formation, the caterpillars, by means of their ready mobility, result in a greater number of extraction tracks than under older methods and consequently a greater and better-distributed area ready for seed-fall. Observations made to date indicate that kauri regeneration will occur in ample quantity on much of the soil disturbed by caterpillar manœuvring.

In Whirinaki managed forest in Rotorua Conservancy, from which over 950,000 cubic feet of podocarp logs were removed by the Service and sold during the year, germination of seed in the logged areas was good, but most seedlings succumbed in the hot summer season. Kahikatea regeneration persists mainly where mineral soil had been exposed during logging. During the year matai seed germinated freely, though it is too early to forecast its survival. The total area under regeneration is 300 acres.

Three beech (*Nothofagus*) stands in Nelson Conservancy were opened up for regeneration by girdling, removal of underscrub, and occasional thinning, the total area treated amounting to 105 acres. Owing to staff shortage due to enlistments, no soil preparation for seed-fall was carried out, but the regeneration secured during the previous year under this method has survived in quantity sufficient for restocking under the object of management—namely, a pole stand for production of mine-props.

In the forests of the south-eastern portion of Auckland Conservancy, kauri and beech grow well in close association, and kauri regenerates well under beech, while beech regenerates freely along tracks and in other openings. Around the clearer forest margins, *Pinus radiata* regenerates so well that it was decided during the year to bring the largest State forest in the locality under preliminary management and, later, working-plan control.

As for natural regeneration in State exotic forests, the main areas concerned are in Whakarewarewa and Waiotapu State Forests, in Rotorua Conservancy, where 126 acres of *Pinus radiata* were clear-felled during the past year. Though regeneration has occurred in sufficient quantity, its survival is not yet assured due to the presence of the pine-bark beetle, *Hylastes ater*.

Section C.—Artificial Regeneration.

35. *Interplanting Indigenous Forests.*—In rimu and other podocarp stands, natural regeneration is, generally speaking, very sparse excepting in Westland forests, and in the North Island in consequence the experimental planting of shade-tolerant exotic trees has been resorted to in gaps caused by felled trees. Two hundred and thirty-two acres of cut-over indigenous forests were interplanted 228 acres chiefly with the exotics *Thuya plicata* and *Cryptomeria japonica*, and 4 acres with the indigenous podocarps totara and tanekaha. Good strikes resulted. Eighty acres previously interplanted were blanked up.

36. *Afforestation.*—Apart from the above-mentioned 232 acres of planting in unburnt cut-over forest, 4,223 acres of open lands were afforested with exotic-tree species, all of it on grass, fern, or scrub lands with the exception of 320 acres of heavily-burned cut-over indigenous forest. Mixed tree crops were formed on 1,071 acres, some entirely in the past year, and the remainder by introducing a second species into earlier plantings or by planting one species for completion later with the second species. (See Appendix III.)

Unthrifty, windthrown, and otherwise damaged areas were replanted over 2,626 acres, while blanking operations occupied 3,238 acres.

Tree seeds collected and extracted totalled 1,456 lb., including 34 lb. of indigenous-tree seeds.

37. *Nursery Operations.*—A total of 2,960 lb. of tree seed were sown, yielding 17,600,000 seedlings as at 15th March, 1941; 92 lb. of indigenous-tree seed are included. Trees lifted for planting, transfer, &c., totalled 9,860,000, and 3,930,000 seedlings were lined out. Tree stocks in all nurseries at the close of the year amounted to 26,000,000.

Section D.—Tending of Forest Stands.

38. *Indigenous Forests.*—Wherever there is natural regeneration and advanced growth in the indigenous forests, many of the saplings require liberation from overhanging or overcrowding inferior species, and where the sapling and pole stands are too dense they require thinning. In the kauri forests alone, thousands of saplings will become potential final-crop trees only if liberated from manuka and other low-story trees, which will otherwise deform and damage the kauri by rubbing, breaking, bending, or suppression. No work of this nature was attempted on a wide face with organized gangs of forest workers, operations being confined to release cuttings by forest officers and caretakers during ranging duties. In three beech forests of Nelson Conservancy, however, several acres were treated, mainly by thinning overdense sapling stands.

Exotic trees that had been interplanted in cut-over indigenous podocarp forest were released from competing shrub growth, the area so treated totalling 395 acres. Interplanted trees of 97 acres were pruned to a height of about 3 ft. and double leaders removed.

39. *Exotic Forests.*—As large an area as possible was tended during the year, but the extent of this work, the carrying-out of which at the appropriate period is essential for the development and welfare of forest crops, suffered owing to the absence of men on military service and to the release of others for immediately urgent agricultural production and harvesting due to war emergencies.

Tree-cleaning.—Four thousand one hundred acres of trees planted in recent years were liberated from suppressing fern, blackberry, and scrub.

Low Pruning.—Trees on 8,368 acres were pruned to a height of about 8 ft. This operation is now carried out almost entirely by the use of pruning-saws, and to a limited extent by specially-designed pruning-shears.

High Pruning.—Trees that will form the final crop were pruned with pole-handled pruning-saws to a height of 14 ft. to 20 ft., the area covered being 941 acres.

Thinning.—The total area thinned was 2,518 acres, of which 2,045 acres received a first light thinning, wood material being utilized where required as camp firewood and odd posts, &c. The remaining 473 acres received a medium or heavy thinning, the forest produce being extracted and sold as sawlogs, poles, fencing-timber, mine-props, and firewood.

Clear Felling.—One hundred and twenty-six acres of *Pinus radiata* were clear-felled for supplying sawlogs to departmental sawmills, and mine-props were cut from the tree tops in many cases. In addition, 7 acres were clear-felled after being windthrown during a severe gale. Five acres of larch were felled for pole-production. (See Appendix III.)

Section E.—Silvicultural Investigations.

40. *General.*—Observations on the natural regeneration of kauri were continued. Ground cover under large kauri trees was removed on an experimental scale two years ago and the ground prepared for seed-fall by scarifying here and there, and results have exceeded expectations. A five-year programme was drawn up and approved for the sustained study of the silvics of kauri and its increment and silvicultural systems, and the programme will be implemented as far as staff available permits.

From each of the four conservancies with an assistant silviculturist comprehensive reports were obtained on natural regeneration of exotic species in State exotic forests. Most of the regeneration is found on margins of firebreaks, but burned over, clear-felled, and windthrown areas were also reported upon, while in some instances regeneration was found spreading on to open lands, generally lands adjoining the State forests. *Pinus muricata* accidentally burned in 1939 when twelve years old has regenerated excellently. On *Pinus radiata* areas clear-felled under the uniform-compartment system ample regeneration has been secured excepting on hard dry portions fully exposed to the sun and wind, where seed has failed to germinate or seedlings are killed by sun-scald. Where logging has been carried out with reasonable care, debris left in the form of slash and lop and top

is definitely favourable to regeneration, as it serves to shelter seedlings from sun and wind and to conserve moisture. The covering of thistles and other weeds which generally come in rapidly also assists regeneration in the same way, and slash burning, unless done very lightly, appears to be detrimental. Larch and Douglas fir show good results only under strip felling where the strips proceed against the prevailing wind. There are several good areas of *P. radiata* regeneration spreading into open country, and on one of these where the regeneration is of all ages between one and forty years the trees are of excellent form with few double leaders, and light branches. Experimental plots will be established for further observation and study.

In most of the State exotic forests trial plantings have been made for years past with rarer tree species and varieties. In some instances these are the only criteria in the Dominion of the growth of such trees. Largely due to changes in forest staff, these plantings have in some instances been overlooked, and during the year steps were taken to have them located, cleaned, and pruned for observation and record of growth rates and suitability for further planting.

An experimental broadcasting in 1939 of Californian redwood seed on cut-over indigenous podocarp forest yielded numerous seedlings, most of which, however, succumbed to sun-scald and wind exposure during the summer of 1940–41. The remaining seedlings, which are up to 6 in. in height, will be kept under observation.

41. *Experimental Plots and Statistical.*—Experimental plots established to study height growth of kauri saplings were remeasured, and while the yearly growth under strong suppression by mature manuka averages only 1½ in., saplings with overhead light and side shelter show a yearly height increment of 9 in. to 12 in. A plot formed in 1937 for studying natural seeding of kauri in a mature stand now shows 12 seedlings per square yard—*i.e.*, 58,000 per acre. All shrubby ground cover was removed when the plot was established.

Plots in Southland beech regeneration and poles, first formed in 1930, were remeasured, and a restudy was made of a number of growth plots in exotic-tree stands.

On permanent experimental plots established in 1939 in Wellington Conservancy for the purpose of studying the effect of planting up indigenous forest that has been cut over and subsequently burned, exotics were pruned and remeasured, and further measurements were made in silver-pine natural regeneration plots. Following a general inspection in 1939 of interplantings with exotic trees in unburned cut-over indigenous forest, a commencement was made with planned establishment of permanent experimental plots on these areas to study the interrelation between the indigenous species and the introduced exotic species, and during the year five plots were established in Erua State Forest, in Wellington Conservancy.

For the purpose of following through the effect of different tree espacements from planting to maturity, two sets of replication plots were formed during the year, one of *Pinus radiata* and one of *Cupressus lawsoniana*.

Section F.—Forest Botany.

42. Collection of records on dates of bud opening, pollen shedding, cone formation, and other phenological phenomena relating to the main exotic-tree species was pursued by the field officers and will be further continued. Eventually these data will enable the building-up of botanical life histories which will throw light on problems connected with seed collection, pruning, natural regeneration, and other forestry operations.

Organized collection and testing of tree seeds was instituted during the year under control plan, both indigenous and exotic trees being embraced by this scheme. Under a plan for the establishment of a northern arboretum for subtropical tree species a start was made by securing several species of kauri (*Agathis*) from other countries, and seedlings of these are now under cultivation in one of the forest nurseries.

CHAPTER VI.—FOREST-PROTECTION.

Section A.—From Fire.

43. As forecast in the last report, the system of recording fires has been intensified to include much closer attention to records of fires that are remote from actual forest areas; and the arrangements for notification of distant fires and intercommunication during the progress of fires have been amplified.

The results of intensified recording show that 2,029 fires were seen and reported by forest officers during last year. Many of these, of course, had no significance to actual standing forest, and were perfectly legitimate land-clearing fires. There can equally be no doubt that many of them were unnecessary and avoidable, and that the constant incidence of such widespread and unnecessary fires has a very evil effect upon the soil of the Dominion.

The more modern intercommunication equipment installed and partially installed (wireless on Rangers' trucks, &c.) proved useful, but has not yet reached its maximum efficiency, and essential wartime restrictions on free use of such methods by civilians prevented its extension. Similarly, military caution demanded the cessation of the daily broadcast of dangerous fire weather in special localities that was begun two seasons ago.

Reference to Appendices V and VI will show how schedules of fire incidence reflect clearly the changes in local weather. In Appendix V, mid-October to late November shows a whole group of fires in the mid-Wellington district, but no fires elsewhere. Appendix VI similarly shows an early January fire incidence in Southland, a faithful reflection of the spell of excellent midsummer weather enjoyed by the southern province.

The actual damage caused by these fires was, with one exception, so slight as to be negligible; but it is to be remembered that the slightness of damage in forest fires is usually in direct proportion to the vigilance and alertness of the patrol staff of the forest workers. But even the utmost vigilance may on occasion fail to avert disaster; and on Boxing Day a full conflagration penetrated the fire defences at Eyrewell State Forest, in Central Canterbury, and well over 1,000 acres of young pines were destroyed before the concentrated efforts of forest staff, settlers from near and far, police, and Air Force personnel succeeded in stamping out the flames. The origin of the fire is still a mystery, though there is no doubt of its location. The fire began in a paddock of thin dry grass next the forest. In the paddock were clumps of gorse and a very open stand of old eucalypt trees. The thin grass in still hot weather evidently burned gently without smoke, and it was not till the fire had a good hold that smoke from gorse and trees revealed its presence to lookout towers. A dead flat area, dry, and without available water save from one small race was not easily handled—the fire running in several directions. It is worthy of record that low-flying aircraft from a neighbouring military aerodrome volunteered and gave excellent assistance in these circumstances in advising the limits of the fire and its different lines of advance, the first instance in the Dominion of co-operation between aircraft and forest-fire fighters.

44. The scheme initiated during the previous fire season was continued whereby meteorological and fire-hazard readings taken thrice daily at eighteen recording-stations in the principal forest areas through New Zealand were available to local officers to assist them in determining the extent of the immediate fire danger. Until it was necessary to impose war restrictions on the radio broadcasting of local weather data, the warnings from the central co-ordinating station indicated whether or not those conditions of hazard were likely to change for the worse: as in the previous year, the essential co-operation of the Weather Bureau was readily forthcoming. Although sufficient data have not yet been accumulated to develop a simple but accurate fire-hazard rating, nevertheless the scheme has been successful in economizing expenditure and in improving the efficiency of the fire-fighting organization.

The relative humidity- and fire-hazard-indicator sticks attained new low levels—*e.g.*, in North Canterbury the former reached 17 per cent., while the moisture contents of both the 100 gram and 400 gram sticks dropped to 6 per cent. The 400 gram hazard-indicator sticks which record the cumulative drying effect of

continuous rainless periods upon the heavier types of potential fuel have proved extremely useful. The number of station days recorded as hazardous according to the arbitrary standard was two hundred for the eighteen stations; approximately half of this number of reports came from three stations in Canterbury during the long fire season.

45. Two new fire districts were created covering an area of 141,000 acres, and making a total of sixty fire districts constituted to date, with a total area of 3,431,068 acres. Notices constituting fire districts are published in the *Gazette* and set out the periods during which it is unlawful to burn save pursuant to a written permit from a forest officer. Under the provisions of the Spark Arrester (Forests Act) Regulations 1925, and a notice issued thereunder, it was specified that from the 1st day of October in any one year until the 30th day of April in the following year no external-combustion engine, except where exemption had been granted, should be used in a State forest or fire district unless provided and equipped with an approved spark-arrester. These regulations and the notice mentioned are now superseded by the Forest (Fire-prevention) Regulations 1940, which provide, *inter alia*, that, except with a written permit from a Conservator of Forests or other forest officer, no person shall use or operate in any State forest or fire district from the 1st day of August in any one year to the 30th day of April in the following year any locomotive, traction, portable, or stationary engine, or any steam or internal-combustion engine whatsoever which is not provided with safe and efficient devices, approved by the Conservator of Forests or forest officer, for arresting sparks or flame from funnel or exhaust and for preventing the escape of live coals or fire from ash-pan or fire-box, while the person in charge of any such engine must dump and totally extinguish any ashes in such a manner as to prevent the outbreak of fire.

Certain machinery used in ordinary course of farming operations is exempt from this provision. It is to be noted that the regulations cover all fire districts. Consequently, privately-owned forests which are protected by fire districts now come within the regulations.

The fire-district provisions apply principally to land-clearing operations and provide the most intensive and effective means of fire control yet devised. A permit to burn is issued subject to the actual burning being carried out only when weather conditions are safe, but by reason of the possibilities of sudden rises or changes of wind which are ever present, burning demands the utmost care and attention from the permittee to ensure that the fire does not get out of hand. Unfortunately, cases have been reported where precautions were most perfunctory and no attention was given to the fire after it had been lighted; ultimately the State forests were threatened, and only the promptness and vigilance of local officers checked the spread.

46. Although the fullest co-operation is extended by forest officers, land-occupiers must realize that it is their responsibility to see that as a result of their action no damage is done to adjoining properties, otherwise they are liable for the damage done. This position is now made clear in the new regulations, as clause 11 provides that a permit to burn given under the fire-district law shall not discharge the permittee from liability for damage caused by any fire lighted by him pursuant to such permit. It is further provided that no such permit is to be acted upon at the time mentioned therein if a heavy wind is blowing or if conditions are such as might cause a fire to spread beyond the limits of the area over which the permit is granted. Regulation 12 provides that the owner or occupier of any land adjoining a State forest or within a fire district upon which there is a fire in danger of spreading to a State forest or parts of a fire district is required immediately to cause the nearest forest officer to be notified, and in the interim to do his utmost to extinguish or curtail the fire, whether he lit it or not. The regulations provide also that in a State forest from the 1st August to the 30th of April following, or in a fire district during the closed season, no burning match, pipe-ashes, lighted cigarette or cigar, or other burning or smouldering substance, or ashes from a gas-producer, shall be left unless totally extinguished. Any person in a State forest or in a fire district, in whatever capacity, must, on becoming aware of an outbreak of fire, take prompt steps to suppress it and arrange for the nearest forest officer to be advised. Similar action must be taken

by any right-holder in a State forest regarding a fire which may occur within 20 chains of the boundary of his area or within 20 chains of the route regularly used in the course of his operations, extending to 20 chains outside the State forest. A right-holder must also provide and maintain fire-fighting equipment in places readily accessible for use. A further important provision is that if in the opinion of the Director of Forestry weather conditions present an extreme fire hazard whereby life and property may be endangered by spreading forest fires, the Director may issue, either by radio or otherwise, an order suspending any logging, sawmilling, or other operations.

It is the earnest endeavour of the Forest Service to eliminate all forms of indiscriminate and uncontrolled burning within and near all forests, and the application of the aforementioned regulations will undoubtedly assist to this objective.

Section B.—Animal Damage.

47. Appendix VII indicates that the regular campaign that has to be carried on against animal pests is amply justified by results. Although the distribution in districts varies somewhat, and the incidence in species also varies, the total number killed is within two hundred of last year's numbers. With the departure of many of the hunting population to the war, and the decreasing availability of sporting ammunition, it is to be expected that the wild-life population will show an upward trend during the incoming years. The only offsetting factor against this is the rapidly-improving price of rabbit-skins.

From the forestry point of view the most disturbing feature of the present schedule is the increase in the number of opossums killed, for it is to be remembered that this schedule lists only those killed out of season under special Ministerial warrant to kill in such localities as are obviously suffering by the animal's depredations. All recent reports tend to prove the slow migration of this animal northwards. It is now reported well up the Auckland Peninsula and is well established in Central and Southern Auckland. It is not many years since the opossum was almost unknown in that province.

Every year new evidence is received of extension of its dietary preferences, for it seems to be curiously selective in its eating habits, and appears to travel some miles without doing much harm in order to reach a species that it regards as a delicacy. Thus, whilst it leaves many species of young pines untouched, it has shown that it seeks out *P. palustris*, a species which, though still in the trial stage, is doing particularly well in North Auckland. It similarly is showing decided preference for *Alnus rubra* around Reefton, where that useful recent introduction is showing its optimum growth. Altogether there is now enough evidence accumulated to enable it to be stated with certainty that the opossum is decidedly harmful in the regeneration and sapling stage of many exotic forests.

The position regarding deer now that all sporting rifles and ammunition are withdrawn for defence use is one for considerable uneasiness in forest areas.

Section C.—Damage from Insects and Fungi.

48. *General Ecology.*—The year has proved favourable to the health of forest trees, and no injury of any consequence from insect, fungal, or climatic agencies has been reported. The dying of large rata trees on the Mamaku Plateau from no apparent cause, and of beech, much of it overmature, due to buprestid and *Armillaria* attack in many parts of the North Island, may be attributed primarily to injury received during the severe westerly gale of January, 1939. Although the actual loss of millable produce is small, it is unfortunate that these dead trees, many of them prominent in various localities, detract muchly from the appearance of the forests. With New Zealand spreadeagled across the "Roaring Forties," abnormal climatic disturbances of this nature must be accepted philosophically, but this ever-present risk makes it imperative that the exotic forests in particular be kept in as healthy a condition as possible by strict observance of silvicultural and management programmes, otherwise the impact of major climatic disturbances may result in the development of ruinous epidemics, from which the Dominion's exotic-forest resource might not recover for several decades. There is also the ever-present danger of the introduction of destructive insects or fungi from other countries; in the

absence of natural controlling agencies, these could cause widespread destruction, particularly to unhealthy stands. Silvicultural measures should therefore be designed to keep the exotic forests in a healthy condition and so make them resistant to damage by pathogenic or climatic agencies. Salvage operations on the area burnt in December, 1937, on the central volcanic plateau have been continued, and will probably be completed in 1941.

49. *Insects.*—The inspection of imported hardwood shipments for termites was continued. Twenty shipments were examined, and in three instances *Coptotermes* were discovered in poles and piles. The poles were cut up and destroyed, but only neuter castes of termites were present, indicating that new colonies could not have been established in these poles.

The *Hylastes* investigations are being continued, and a number of sample plots were laid out in cut-over areas to determine the length of time the *Hylastes* remain active in stumps and logs and their effect upon regeneration. The present indications are that serious destruction of seedlings may be expected during the second year after felling.

50. *Fungi.*—There has been little fungal disease of any consequence in State forests and no new disease has been recorded. Damping-off has caused trouble in nursery beds in a few instances. Although *Armillaria mellea* continues to cause many deaths in exotic and indigenous forests, it must be regarded as a normal ecological component of both types of forests, functioning as an important breaking-down agency of waste material.

Investigations upon the rot fungi and insects which destroy timber in process of both conversion and use was continued. In this connection some thirty timber-yards were examined and reported upon and a number of sawmills and felling operations inspected.

The study of heart-rot in living trees was continued, and much information is being accumulated. An investigation of the brown cubical heart-rot of kaikawaka at Erua showed that it is caused by *Polyporus braunii*. Infection appears to take place at the tops of trees damaged by snow or wind and spreads downwards, completely destroying the heartwood. In the area investigated the majority of trees are attacked by this fungus, which renders this otherwise durable timber worthless. The possibility of this fungus attacking *Thuya plicata* is being investigated. Other fungi investigated include a species of *Fomes* which causes a brown heart-rot of *Olea cunninghamii;* white-pocket heart-rots of *Elaeocarpus dentatus* caused by *Trametes sp.* and *Fomes zelandicus;* the white-pocket heart-rot of rimu caused by *Polyporus proprius;* and white heart-rots of *Weinmannia racemosa* caused by *Polyporus berkeleyi* and *Fomes zelandicus.*

Section D.—Damage from Natural Causes.

51. Although the weather as a whole may be claimed to have been normal in the sense that there were no severe storms, frosts, or prolonged droughts causing disease epidemics, the distribution of rainfall and sunshine was far from normal in many localities, and nursery stocks in places suffered severely. The season in general was one of great anxiety for the foresters in the nursery and the fire-protective branches, and was made none the easier by the staff depletions due to enlistments.

Southland experienced one of the driest and hottest summers in its history, and losses in newly lined out nursery stocks in this conservancy were heavy owing to the lack of spring rains. Canterbury experienced a similar dry period in late spring and early summer, with the result that virtually the whole of the seed sown in the new nursery at Ashley failed to germinate. For over six weeks after the seed was sown, not a trace of rain fell. Although both Wellington and Auckland Conservancies also experienced dry spells, no damage other than by fire was recorded in the former. In Auckland lack of rain was reflected in the complete failure of seed sown in Waitangi Nursery—comparable to the Ashley failure in Canterbury—though the crop grown on the moister west coast of the Auckland Peninsula at Waipoua was excellent. During this general drought period of late spring and early summer the northern portion of Rotorua Conservancy experienced torrential rains, and the newly-sown and germinating seed at Pongakawa suffered flood damage and subsequent damping-off during early summer.

Section E.—Forest Offences.

52. It cannot be reported that forest offences are decreasing. Difficulty of detection over the wide, uninhabited areas that constitute the bulk of the State forests is intensified by the current shortage of staff, and undoubtedly more offences are committed than are discovered. In the matter of moving for prosecutions the Forest Service has exercised considerable forbearance, but the fact that no improvement is shown in the number of offences discovered indicates that the Department must take a much more serious view of future offences. Sheep-worrying has been elevated to a special place in New Zealand law solely on account of detection difficulties. With the sanctity of the forest as an additional reason, timber trespass and forest fires might be ranked equally with sheep-worrying in requiring offenders to prove their innocence.

In addition to policing forests for offences against the Forests Act, forest officers are in most case charged with the duty of detection of offences against the Animals Protection and Game Act, and, as the issues in such cases are usually more clear cut, there is usually less difficulty in securing convictions if the offence is detected. Two such offenders were convicted of shooting pigeons after apprehension by Forest Rangers; and one other was convicted of offering violence to the Forest Ranger performing such duties. The penalty imposed in the latter case was somewhat less than in the pigeon-shooting cases.

Under the Forests Act, a dredging company was convicted of illegal timber-felling and fined £138 in all (inclusive of £69 stumpage value of the timber taken). Forest officers in the same district were responsible for securing a further conviction for timber trespass on Crown land.

CHAPTER VII.—FOREST ENGINEERING.

Section A.—General.

53. No new major engineering project was put in hand during the year, and the work under this head was confined in the main to minor additions, alterations, and adjustments to the existing plants to secure increased efficiency and economy in production. Regular inspections of all plants have been made.

Section B.—Roads and Bridges.

54. Roading operations, both maintenance and construction, have been limited by available equipment. It has now been established beyond all possible doubt that even in the so-called light pumice country the highest powered roadmaking equipment is the most efficient and economical. Medium-powered tractors may be used for maintenance purposes, but as judged by the horse-power available per linear or square foot of angle-dozer blade they are underpowered for continuous road-construction, which invariably causes excessive wear and repairs, &c. Even for fire-break construction and maintenance the highest-powered machines are the most economical, except in the case of small isolated forest units where smaller machines may be economically employed for both roading and fire-break work.

Due to the necessity for maintaining existing roads and fire-breaks to a fairly high standard as an essential factor in the general fire-protective scheme, new construction has been curtailed. Only with difficulty has it been kept ahead of immediate requirements at the Whirinaki logging operations and at the Whakarewarewa Exotic Forest. As lack of adequate roading is hindering the orderly application of silvicultural measures essential to the permanent management of both forests, every effort is being made to extend the roading well ahead of logging and thinning requirements. In both these Rotorua forests and in the kauri forests of Puketi and Omahuta much of the roading is of a permanent nature and more than ordinary care is being exercised both in location and in construction. The experience gained in the Whakarewarewa Forest serves to emphasize more than in any previous instance the absence of intelligent road planning in the earlier-established exotic forests. Almost invariably the roads on the exotic forests have been located to expedite planting and establishment activities and without any thought to the ultimate management and logging of the tree crop. Costly relocations are inevitable, and the utmost care is therefore being exercised in the case of all new exotic forests to ensure that a proper roading scheme is adopted at the outset.

One new 30-ft.-span bridge was erected on the Puketi State Forest Road, and plans were completed and preparatory work done for two bridges in the Rotorua Conservancy to demonstrate the value of creosoted pine timber for this purpose. Features of the design are the use of round timbers (to facilitate creosoting) for the principal members and of laminated construction for decking purposes.

Section C.—Other Transport Facilities.

55. Alterations and additions have been made by the New Zealand Railways to the station-yard at Rotorua, facilitating the handling of forest products outwards from Rotorua, and of creosote and stores inwards for use at the Waipa Mill. The only outstanding deficiency is the provision of adequate covered storage and loading-facilities, which are essential to the safe and efficient handling of seasoned and kiln-dried products in the form either of timber or box-shooks.

The extension of the Rotorua Railway to Reporoa becomes of ever-increasing importance. Without this extension, no proper development of the forest resources of the Kaingaroa and Waiotapu Forests is feasible, and it is hoped that the necessary construction will form an urgent post-war rehabilitation project.

In the Kaingaroa district one regular and several emergency landing-grounds have been located by the aeronautical staff of the Public Works Department for use by aeroplanes engaged on surveying and fire-protection activities.

Section D.—Buildings.

56. In order that all existing residences and buildings belonging to the State Forest Service shall be maintained in a good state of repair and made to conform with modern standards of living, a number of dwellings have been renovated and brought up to date with modern amenities such as hot-water services, sewerage, &c. Some of the older buildings are reaching the state where replacement is economically advisable.

With regard to new buildings, much careful thought and planning have been given to the question of providing Service field employees with a better type of residence than has hitherto been supplied. Several reasons have dictated this course —*e.g.*, to quote only two, more stable and permanent works than formerly, and difficulty in retaining married men when competitive industry of a similar nature without and even within the Government Service offers better housing accommodation. Although the State exotic forest establishment period was spread over several decades, the work was seasonal, being mainly in the winter months, and the Service had not the same responsibility for housing its workmen as now, when the forests are either on a maintenance basis with a permanent staff or are being actively utilized also with a permanent but much larger staff of employees—in a word, changing conditions demand improved accommodation, and the Service is dealing with the problem and remedying the position as rapidly as possible. Some relief in the accommodation for married men has indeed been afforded by grouping one, and two-men hutments, but obviously this method has its limits and is at best a makeshift to tide over in the meantime.

A building experiment featuring the use of State-grown exotic timber has been carried out by building three new houses at the Waipa Mill village. In these houses an effort has been made to provide the normal amenities of the modern town dwelling in a minimum area—viz., modern sanitation, drainage, &c., and electric light. These were the only new houses erected. Additional buildings at the Waipa Mill include an office, hostel, workshop, and garage. The hostel provides accommodation for sufficient single men to ensure prompt assistance in a fire emergency at the adjacent plant.

Section E.—Water-supply and Drainage.

57. There is little to report under this head; existing plant equipment has been maintained, and renewed where necessary. Increased supplies of water are urgently required at headquarters at Kaingaroa, Waiotapu, and Rotoehu Forests to provide improved domestic facilities for drainage and sanitation. An alternative flood emergency supply is necessary for Waipa Mill. It is hoped to give attention to these matters during the current year, and in the meantime to sink wells at Kaingaroa to supplement the present supply. Elsewhere, and particularly in the Rotorua Region, satisfactory drainage and modern sewerage systems have been installed wherever practicable.

Section F.—Utilization Plants.

58. The major activity during the year has been the completion of the demonstration log gang sawmill, now known as the Waipa State Mill, on the Whakarewarewa State Forest about three miles from Rotorua. As a demonstration unit the mill has been thrown open to inspection both by sawmillers and forest-owners in order that all may benefit by the Department's experience in adaptation and integration of North European and North American equipment to the utilization of New Zealand-grown exotic pines. This experience has been largely confirmatory of the Department's original conception of the enterprise, but also invaluable in indicating future modifications and developments. Refinements in operation, of course, are still being developed as a result of accumulating experience.

First and foremost is the experience gained in logging insignis pine off pumice country. Due to lack of silvicultural treatment at appropriate times, the stands contain such an excess of standing dead and dying timber that not only have they been dangerous to log, but also expensive. Neither is it impossible that this condition of the forest may so favour the development of the destructive insect *Hylastes ater* as to not merely destroy all natural regeneration but to prevent planting for several years, and then only at a high cost. Although tractor arch logging was originally provided for, tractor skidding has been employed as a trial, but with limited success, even soaking in the log pond and log-washing at the log-conveyor failing to remove the excessive quantities of pumice picked up by the logs when ground skidded. Both local and imported arch equipment is now being brought into operation, with a marked reduction in the average amount of pumice picked up by logs.

The step up in production as a war measure to 125 per cent. of planned capacity naturally prevented the building up of log reserves to an adequate level, with the result that top logs were insufficiently seasoned and have given trouble as sinkers when placed for sorting purposes in the log pond. With a diesel-engined hauler supplementing the existing tractor equipment, adequate reserves and seasoning will be possible and sinkers eliminated. Owing to the proven economy of long-length log handling and haulage in clear-felling activities, the log pond is being supplemented by mechanical log-crosscutting equipment and dry-sorting facilities. Longer soaking and improved log-washing, together with other developments, are expected to reduce pumice troubles to an acceptable standard in respect both to the amount deposited in the log pond, which must be sluiced out from time to time, and to that reaching and dulling the saws, with consequential reductions in output.

In the sawing of reasonably-straight even tapered logs the North European log gangs and edgers, &c., have functioned almost perfectly. The capacity is well illustrated by the fact that as many as 922 8-in.-mean-diameter logs have been sawn in seven hours fifty-five minutes. By no other means could such economy of sawing be achieved. It is already clear, however, that even the closer-planted stands are yielding an appreciable percentage of logs which are so rough as to necessitate working up on band-saws. Particularly in the future milling of 8 ft. planted stands, provision will require to be made for the incorporation of such units. In addition, a fundamental study is warranted into the possibilities of log gang saw adaptation to the sawing of short billets, an enormous quantity of which is now wasted in logging and contributes to the danger of widespread development of *Hylastes ater*. Although a high standard of sawing technique has already been developed, it was not attained without searching investigation and trial by the operating staff. The elimination of waviness in sawing in the main frame and the improved results following this substitution of spring set by swaged saws reflect credit on the responsible officers and staff. The engineering features of the remainder of the plant being largely orthodox, deserve no special mention. Fuel-bin capacity was found inadequate for week-end operation of the kilns, and additional bins are being provided accordingly. In the box-factory operatives are being trained in the use of the new equipment, and full production will be attained for the next boxmaking season. Fire-protection services are carefully maintained and regularly tested.

Minor engineering work of a maintenance character was carried out in connection with the creosote plants at Waipa, Hanmer Springs, and Conical Hill, the operations of which are referred to elsewhere. At Waipa the supply of steam from the main State mill power-house has greatly facilitated operations.

Section G.—Transportation.

59. There have been no additions to the departmental fleet of motor-vehicles. In consequence, the increased transport demands arising out of timber control and new utilization activities have necessitated careful organization of both car and trucking operations, and it has been essential to conserve not only vehicles but petrol. Repairs have been carried out on vehicles which in normal times would be replaced, and it appears that this policy must be pursued until the cessation of hostilities. The three-axle trucks with two rear axles driven continue to demonstrate their usefulness on all types of roads, although their superiority over other types has been most evident on low-grade roads and unformed forest tracks. In fact, on these latter, particularly in the pumice country, no other types are usable. Logging operations in the Whirinaki and Whakarewarewa Forests have likewise proven the superiority of tandem-axle pole-type trailers for the transport of long-length logs. In the Waipa Sawmill yard the straddle-type lumber-carrier and the end-lift truck have exceeded all expectations, as not only do they handle the timber, already stickered and piled in unit packages, direct from the sorting-table into piles in the seasoning-yard and on the dry-kiln trucks, but they dismantle these after drying and transfer the unit package direct on to the planing-mill and box-factory-shop trucks. The yard operations of the end-lift truck have indicated that for use on pumice or earth roads pneumatic tires are essential, and only on concrete or similar unyielding surface can the solid-tired equipment be satisfactorily operated.

Close contract has been maintained with the Substitute Fuel Technical Committee, which has been responsible for the development of a charcoal-burning producer-gas unit. The Forest Service has fitted two trucks with units made in accordance with the first design of the Committee, and a further five will shortly be procured, these incorporating improvements in design which operating experience and testing have shown to be desirable. The use of such equipment necessitates extraordinary care and maintenance of engines to minimize the extra wear on all moving parts caused by tar and other impurities.

Section H.—Communications.

60. A total of 20 miles of telephone-lines (8 earth-working circuit and 12 metallic) was added to the existing lines, 1½ miles were dismantled, 10 converted from earth to metallic circuit, and 3 taken over by the Post and Telegraph Department. Eight instruments were added. The total length of line is now 371 miles—265 miles earth-working and 106 miles metallic—with a total of 180 instruments. At Kaingaroa 11 miles of line were renewed and the wire duplicated, while 2 emergency telephones were installed in boxes in remote parts of the forest. A new fifteen-plug switch-board was installed at Kaingaroa Headquarters in a hut specially built for this purpose and for the radio-telephone equipment. An attendant lives in the building and operates both the line and radio telephones as required, giving practically twenty-four-hour service. At Hanmer Forest the first 3 miles of line have been taken over by the Post and Telegraph Department as part of a reconstruction scheme in the establishment of a departmental telephone-exchange for Hanmer Township, and the eight Service telephones there are now connected with the exchange. As forecasted in last year's report, radio-telephone equipment has now been installed as an auxiliary service at Kaingaroa and Rotorua. The equipment has been used to report on fire-weather conditions and was also used at three fires which occurred in the vicinity of the forest. At two of these fires no difficulty was experienced in maintaining satisfactory two-way communication, but at the other no contact was made due to a local thunderstorm and not improbably the inexperience of the operator. (Appendix IV.)

Section I.—Village Planning.

61. At Kaingaroa consideration is being given to the establishment of a new Ranger district headquarters incorporating an aerodrome, and tentative plans have been prepared, embodying all the principles of modern neighbourhood planning. The scheme will make provision for an administrative section including offices, depots, &c., a business section with shops, petrol-station, and other essential public facilities, and a community centre including church, school, and hall for library and cinema; playing-fields will also be provided for.

CHAPTER VIII.—EXTRACTION AND COMMERCIAL DEVELOPMENT.

Section A.—State Forest Block Sales and Permits.

62. The year's operations disclose a decrease both in number of appraisals and the quantity of timber cruised. The number of appraisals has decreased from 178 for 1939–40 to 156 for 1940–41, the quantity of timber involved falling from 156,920,000 board feet to 134,200,000 board feet, of which 25,633,000 board feet in 13 appraisals was for other Departments. Check appraisals were carried out on representative areas of 23 blocks involving the sale of 36,548,000 board feet.

In sympathy with the increased demand for sawn timber, State Forest block sales showed an increase of 16,750,000 board feet, rising from 77,374,000 board feet to 94,124,000 board feet (vide Appendix VIII). Only a slight increase, however, was shown in the quantity of sawn timber actually produced from State forest and Warden areas, the total recorded cut being 112,512,000 board feet, as compared with 112,000,000 board feet for 1939–40. Permits to cut indigenous firewood, fencing-material, poles, railway-sleepers, and mining timbers were in good demand, the timber sold comprising 270 cords of firewood, 287,661 posts and stakes, 11,714 strainers, 144,881 battens, 6,445 poles, 3,094 sleepers, 5,114 house blocks, and 113,680 pieces of mining timber.

The forest-produce cut under permit from exotic forests included 30,131 posts and stakes, 50 strainers, 4,665 battens, 2,285 rails, 466 poles, 3,118 cords of firewood, and 13,667 pieces of mining timber.

Section B.—State Forest Log Sales.

63. Under pressure of the war emergency, log sales from both indigenous and exotic forests have increased. In Auckland, kauri logs containing 10,424 cubic feet and podocarps containing 122,994 cubic feet were sold at a total price of £5,253 3s. 3d. In Rotorua Conservancy log sales from Te Whaiti State Forest comprised 383,153 cubic feet of kahikatea, 87,746 cubic feet of matai, 448,809 cubic feet of rimu, and 10,685 cubic feet of totara, making a total of 930,393 cubic feet, valued at £21,865 8s. 8d. for the manufacture of cheese-crate scale boards, 19,611 cubic feet of white-pine peeler logs were sold to an Auckland firm, at a price of £1,362 8s. 8d. In Wellington Conservancy log sales comprised only 400 cubic feet of rimu, 2,500 cubic feet of kahikatea, and 100 cubic feet of totara, a total of 3,000 cubic feet, valued at £45. In Nelson Conservancy silvicultural treatment of beech regeneration areas was continued, 740 pieces of mining timber with a volume of 993 cubic feet being extracted and sold for £29.

From exotic forests logs aggregating 189,737 cubic feet, together with fencing-material and mining timber obtained from thinnings and windthrows, were sold for £6,248. In Rotorua 27,515 cubic feet of logs, 88,568 posts, 3,720 stays, 5,975 rails, 25 house blocks, and 134,018 pieces of mining timber were sold for £3,866. At Balmoral (Canterbury) sales of thinnings and windthrows totalled 23,372 cubic feet, valued at £146; and in Southland at Conical Hill and Dusky Forests, sales from thinnings and windthrows amounted to 138,850 cubic feet, with a value of £2,236.

Section C.—Production and Sale of Manufactured Forest Products.

64. As in European countries with a strongly developed forest economy, State mills are operating primarily as control and demonstration units to establish adequate values for State-owned timber, and are managed accordingly as integral parts of the milling industry, subject to the fundamental tests of profit and of consumer satisfaction. Their operation likewise is made to conform to the general policy agreed upon by the Government and the industry that supply and consumption shall be kept in balance as far as practicable by control of the amount of standing timber on State forests offered for sale from time to time. Unless the immediate future demand for timber at any particular period warrants the disposal of State timber, it is reserved for later use.

At the outbreak of war, however, it was necessary to implement this policy in Southland, where most mills were working at only a fraction of their normal capacity; and although the operating ratio of rimu units was much improved by zoning the Dunedin market from Westland to Southland and Otago sawmillers as discussed in the last report, the supply of boxing-timbers continued much in excess of demand, and the suspension of State milling activities in Southland initiated last year was continued. In the North Island the supply-demand conditions for exotic timbers have presented a sharp contrast, and but for the operation of the main Waipa and the portable Waiotapu State mills it would have been necessary to import several million board feet of boxing timbers to meet the acute shortage which otherwise would have developed.

65. The Waipa State mill, the engineering features of which are discussed elsewhere, constitutes the Department's major exotic forest milling unit. It commenced operations on a preliminary scale in June, 1940, but by October continuous production had been established at a level representing 125 per cent. of the original planned daily capacity of 20,000 board feet. Production has since been maintained at the 25,000 board feet per day level as a war effort to expand production of insignis pine, but this represents the practicable maximum if the mill is to be assured of perpetual log supplies and the Whakarewarewa State Forest managed on a sustained yield basis.

Logs sawn in the mill vary from 6 in. to 26 in. in diameter, with an average of about 14 in., and rate of production naturally varies with size. A maximum daily output of 35,000 board feet was secured while sawing logs 12 in. to 15 in. (top diameter). The maximum four-weekly output of 558,000 board feet was attained for the period ended 31st March, 1941, and represents an average daily capacity of almost 28,000 board feet. On the smallest-size logs the daily capacity may fall as low as 15,000 board feet.

Owing to the relative sparsity of large-diameter logs, the percentage of wide timber was not very high. Sales under 6 in. wide totalled 1,265,000 board feet, representing 49 per cent.; over 6 in. but under 9 in. wide, 1,088,000 board feet, or 42 per cent.; and widths exceeding 9 in., 221,000 board feet, or 9 per cent.

Production of sawn timber amounted to 4,064,000 board feet, of which 2,574,000 board feet was sold, and the balance used or stacked in the air-seasoning yard for subsequent utilization in the box-factory. Stock on hand at the 31st March, 1941, totalled 1,310,000 board feet. The output consisted almost wholly of insignis pine, only negligible quantities of Corsican pine and European larch being dealt with. Details of timber sold were as follows:—

Green sales ..	1,355,000 bd. ft.	£9,940 (14s. 8d. per 100 bd. ft. f.o.r. Rotorua).	
Air-dry sales ..	664,000 ,,	£6,507 (19s. 7d. ,,).	
Kiln-dry sales ..	555,000 ,,	£6,082 (21s. 11d. ,,).	
Total ..	2,574,000 ,,	£22,529 (17s. 6d. ,,).	

Representing commitments entered into soon after the commencement of sawing and prior to the expansion of the local demand by recent war developments, 323,000 board feet were sold to Australia.

66. The Waiotapu mill, one of the portable circular type, operated throughout the year, and from 11th November, 1940, to 14th March, 1941, a double shift was worked on account of the acute demand for insignis pine, but the difficulty of securing suitable labour led finally to the abandonment of the second shift. Originally established to supply the heavy constructional timbers for the large Waipa mill, &c., the mill has since been engaged on the salvage of insignis pine from a stand which threatened to become a serious loss owing to lack of early silvicultural treatment. Logs were even smaller than at the Waipa operation, and a low average width of sawn timber was secured. Timbers sold under 6 in. wide totalled 614,000 board feet, or 73 per cent.; those over 6 in. wide but under 9 in. 9 in. wide, 213,000 board feet, or 26 per cent.; and widths greater than 9 in., 10,000 board feet, or only 1 per cent. With circular sawing it is not possible to secure widths from small logs yielded by a log frame; and this accounts for the much greater proportion of widths greater than 6 in. which were obtained at Waipa.

The mill produced 1,427,000 board feet of insignis pine, of which 837,000 board feet was sold, and the balance used in the construction of mill buildings at Waipa or reserved for subsequent use in the Waipa box-factory. Details of timber sold were as follows:—

Green sales ..	767,000 bd. ft.	£6,088 (15s. 10d. per 100 bd. ft. f.o.r. Rotorua).
Air dry sales ..	70,000 ,,	£632 (18s. 1d. ,,).
Total	837,000 ,,	£6,720 (16s. 1d. ,,).

67. The fundamental financial objective of the Waipa sawmill—viz., establishing an adequate stumpage value for State forest exotic timber in the Rotorua Conservancy—has already been achieved. When efforts were made over a period of seven years to interest private operators in the working-up of this timber by modern North European mass-production equipment, the only comment was that "match sticks" could not be economically converted into sawn timber and that in any event they were worth less than 1s. per 100 board feet. As judged by the usual type of operation, such a valuation might even be on the high side as indicated by the experience of one privately-owned mill operating on State forest exotic logs in another conservancy. In this particular case, as the forest badly required thinning, it was decided as an experiment to allow a local type of mill to secure exotic-log supplies from the silvicultural operation, but although these logs have been secured free of all stumpage, the company has experienced a very substantial loss in its operation.

With departmental valuation for the Rotorua stumpage at not less than 2s. per 100 board feet, or three times the ruling value of that date, the Government embarked on the Waipa enterprise. From the date of its commencement the Utilization Branch, under which the mill operates, has paid to the Whakarewarewa State Forest Account a stumpage of 2s. 6d. per 100 board feet for all clear-felled insignis pine, and within nine months by the 31st March, 1941, production costs had been reduced to a point where after paying this stumpage, after allowing for depreciation and obsolescence, and after providing for interest on capital, a small profit margin was available. It is hoped that the profit margin will be increased within the near future to a point which will allow the stumpage of 2s. 6d. per 100 board feet to be increased, even after payment of income-tax.

68. The other test of successful operation—consumer satisfaction—is being successfully met, although not without the occasional exceptions inherent in the bringing into full production of a plant of such large capacity. From the outset of the enterprise, three specific consumer objectives were defined—the production of precision-sawn timber, the delivery of bright clean stock free of stain and mould, and the effective merchandising of the timber.

As regards uniformity of sawing, this is strikingly illustrated by the reaction of the first Wellington customer to the first truck received. He was insistent that a visit be paid to his factory in order to see the unbelievable result of planing the truck load. Instead of the usual twelve sacks of shavings from the customary load of circular sawn timber, he had only two sacks full. The equivalent of the other ten sacks had been sold by the mill in the form of boards to other customers.

Both kiln drying and chemical dipping have been used to prevent sapstain, &c., and found wholly successful. Only when the treatments have been improperly applied or where no such protection has been provided, as, for instance, at the small portable mills, has there been any serious trouble with sapstain. The general freedom from stain, &c., of the Waipa stock and its bright clean appearance have gone a long way in gaining the confidence of wood users in its possibilities for a much wider and more valuable field of employment than previously. Chemical dipping is applied only in the case of timber for air seasoning and is unnecessary when the timber is to be kiln dried.

The application of modern merchandising developments to the Waipa sales has been limited to date to the export section of the trade. Here flitches and boards were accurately trimmed and square cut to standard lengths and both ends of each distinctively branded with the departmental trade-mark and timber name. The results exceeded all expectation, the preparation and appearance of the export parcels earning universal commendation from every section of the Australian trade.

With greater experience and added efficiency in execution, all three developments will add to the value of the timber, and, indeed, have already commenced to do so as far as the Australian market is concerned, so that ultimately both the profit margin and the stumpage value may be still further increased.

69. The three creosoting plants at Rotorua, Hanmer, and Conical Hill were in operation throughout the year. The total production of creosoted products was as follows: 81,029 posts and strainers (66,082 cubic feet) 4,576 poles (21,768 cubic feet), and 14,361 cubic feet of miscellaneous sawn timber. Good progress has been made in the marketing of creosoted timber, total sales amounting to 50,294 posts and strainers (48,822 cubic feet), 1,815 poles (10,296 cubic feet) and 1,456 cubic feet of sawn timber. In addition to these sales 8,745 posts and strainers, 1,508 poles, and 6,765 cubic feet of sawn timber were used by the Department; 153,287 gallons of creosote were used in the treatment of this produce. Manufactured in New Zealand, this creosote is required to conform to a British Standard Specification: a large number of samples were analysed to ensure that such was the case. So that supplies of fully-seasoned timber will be available when required for creosoting, it is necessary to have in the seasoning-yards approximately a year's requirement in progressive stages of drying. Thus, 98,810 posts and strainers (94,011 cubic feet) and 6,040 poles (25,971 cubic feet) were in process of seasoning at the end of the year. (This information is scheduled in Appendix IX.)

North Island requirements were supplied from the Rotorua plant, where 62,647 fencing-posts, 1,045 poles, and 12,086 cubic feet of miscellaneous sawn timber were creosoted; in the South Island the Hanmer plant creosoted 9,386 posts and 2,318 poles, and the Conical Hill plant 8,996 posts, 1,213 poles, and 2,060 cubic feet of sawn timber. The demand for creosoted fencing-posts from Rotorua has increased appreciably, 45,563 posts having been sold, while in the South Island the demand for creosoted poles has been stronger than that for posts. No difficulty was experienced in securing markets for all the poles that could be produced at the three plants, the largest order being from the New Zealand Railways for 18 feet to 24 feet creosoted larch poles.

The wider use of creosoted timber continues to be developed, the outstanding item constructed during the year being a pontoon built of 1,200 cubic feet of prefabricated creosoted insignis pine. Considerable quantities of creosoted sawn timber for such miscellaneous purposes as culverts, bridges, wind-towers, &c., have been supplied, in addition to increasing numbers of posts and poles. Steps have been taken to ensure that larger numbers of creosoted poles will become available to supply authorities, who normally obtain their pole requirements from Australia. Specifications for the creosoted treatment of posts and poles have been drawn up and no produce is sold which does not conform to these standards.

Section D.—Equipment and Operating Technique in the Forest Industries.

70. War conditions have curtailed the purchase of modern equipment for both logging and milling operations. Import restrictions, rising prices, and delay in obtaining deliveries have all been deterrent factors. Nevertheless, tractor logging continues to grow apace, and steam haulers are being further replaced by Diesel-engined machines. As in roading-work, the highest-powered tractors appear the most economical.

Other than the installation of the log-gang saws in the Waipa Mill, elsewhere referred to, no developments of major significance have occurred. Kiln-drying facilities, however, continue to expand. In addition to the four-kiln unit established at the Waipa sawmill, a two-kiln unit was installed at Ashburton, whilst at Christchurch a new kiln was added to an existing two-kiln unit. The general technique of operation has now advanced to a point where unsatisfactory drying is relatively small, and the increasing confidence of users in kiln-conditioned timber is likely to result in many more installations within the near future. A number of new plants have been established for the dipping of green timber to minimize sapstain and of seasoned timber to minimize fungal and insect attack.

Two important forest industrial developments ancillary to sawmilling have occurred during the year. The first is the establishment at Auckland of a new modern plywood factory, which is expected to come into early production. With

ever-shortening plywood supplies from abroad as a result of the war, this development is a welcome one, particularly in view of the competitive element which it is likely to introduce into the plywood industry in respect to both price and quality. The second development is the installation of an integrated sawmill structural fibre-board plant by N.Z. Forest Products, Ltd., at Auckland. This also is anticipated to come into early production and will likewise relieve the shortage of both exotic timber and imported structural fibre-board. The enterprise is a licensed one, and the interests of all other growers of exotic timber have been safeguarded by a provision that the owners may be required by the Bureau of Industry to purchase raw material from their forests.

Section E.—Timber-production.

71. The output of sawn timber for the year ended 31st March, 1940, as reported by the Government Statistician, totalled 336,000,000 board feet, an increase of 6 per cent. over the previous year's cut and 11,000,000 board feet over the estimated cut. The acceleration in demand which began on the outbreak of war enabled many plants to work to capacity, with the result that the highest production since 1925–26 was achieved. The distribution of production by species and districts is scheduled in Appendix XIII. The demand for timber has continued strong ever since, and it is estimated that a cut of 340,000,000 board feet will be secured for the year 1940–41.

72. The increase for 1939–40 was confined to two species—viz., rimu and insignis pine—which accounted for 75 per cent. of the total production. As expected, the output of kauri and matai was reduced, but the production of white-pine, totara, and beech remained at practically the same level as in the previous year. Rimu, the principal timber used for both civilian and defence constructional activities, reached a peak figure of 206,000,000 board feet—almost treble its minimum production of 71,000,000 board feet recorded in the depression year 1931–32. The growing demand for insignis pine is illustrated by the increased production from 10,000,000 board feet in 1929–30 to 47,000,000 board feet in 1939–40, at which level it now accounts for 14 per cent. of the total cut and ranks second only to rimu in importance.

73. From the outbreak of war to the date of the fourth ballot, official figures show that 1,207 men connected with the sawmilling and timber industry (about 16 per cent. of the total number engaged therein) had joined the defence forces. Impressive as these figures are, they become more so when it is pointed out that they might well be increased by another 200, as it is known that many timber-workers were not included in that category owing to the fact that when registering for service they omitted to define clearly their civil occupations. Only sixty-one key men have been withheld from service, and they too will gradually be released as substitutes now being trained become sufficiently competent to step into the key positions.

Section F.—Domestic Markets.

74. Production has been unable to keep pace with demand during the year, and in general timber stocks have dropped to the lowest level for a decade, more particularly in the North Island than in the South, where the position has been easier. Although, as was expected, domestic building dropped considerably, 6,011 permits were issued for dwellings, as compared with 6,549 issued during 1939–40—a decline of only 8 per cent. This small decline in house-building has been more than counterbalanced by the erection of defence and emergency works of various descriptions, the difficulty of securing steel, &c., and the extreme urgency in construction work having compelled the extensive use of timber.

Insignis pine is now accepted as the standard timber not only for concrete boxing and for the manufacture of containers other than butter-boxes and tallow-casks, &c., but also for such purposes as the frame or core of flush doors, &c.; its use in domestic building, particularly in rural districts, is likewise extending. Throughout the year consumers experienced considerable difficulty in securing supplies, and now that current production cannot keep pace with demand, stocks are being rapidly depleted, and it is anticipated that priority of supply for essential uses will be necessary. The more extensive use of beech, rimu, and matai for general boxmaking is therefore inevitable.

During the first year of the war the prices of building timbers were unaltered, but increases in sales tax, wages, transportation, and cost of supplies, &c., which have occurred over the last two years led ultimately to an application to the Price Investigation Tribunal for increased prices, a small average advance being granted after a careful investigation of the facts.

Section G.—Imports.

75. Rising prices, restricted supplies, shipping difficulties, and conservation of exchange funds have combined to reduce timber importations from all sources to an absolute minimum consistent with meeting demands for essential purposes. As reported by the Comptroller of Customs, the imports for the calendar year 1940 totalled only 15,000,000 board feet valued at £300,000, as compared with the 1939 importation of 43,500,000 board feet valued at £640,000. By reference to Appendix X it will be noted that all species of timber, including Australian hardwoods, North American Douglas fir and redwood, and Japanese oak, contributed substantially to the marked reduction in imports. As discussed in various sections of this report, local substitutes are being developed as rapidly as possible and existing supplies conserved for essential uses.

Section H.—Exports.

76. Exports of timber increased considerably during 1940, and the 17,000,000 board feet shipped was equivalent to a 33-per-cent. increase on the previous year's exports. As in former years, over 90 per cent. of all timber exported was purchased by Australia, the balance being forwarded to the Pacific islands, principally in the form of box-shooks for the subsequent carriage of bananas and other fruit to New Zealand. Exports are scheduled in detail in Appendix XI. Rimu, by virtue of its predominance in local production, was exported to the extent of almost 12,000,000 board feet and represented 69 per cent. of the total timber exports. This is the largest annual export of rimu since 1920, when approximately 15,000,000 board feet was shipped. The species is exported principally from the port of Greymouth, on the west coast of the South Island, although small shipments are occasionally made from isolated districts in the North Island. Sap matai was shipped to the extent of 1,000,000 board feet, but export has virtually ceased on account of local requirements absorbing all current production. Silver-beech sales to Australia increased from 1,258,000 board feet for 1939 to 1,575,000 board feet for 1940, but the necessity for developing the local use of beech as a substitute for imported oak is unlikely to allow any further expansion in the Australian trade. Insignis-pine exports at 1,888,999 board feet were a record for the species. In previous years this timber was shipped from New Zealand almost entirely to the Pacific islands in the form of box-shooks, but during 1940 Australia purchased approximately 250,000 board feet of the species in the form of boards and flitches. Although some of the flitches were used for box-manufacture in Australia, most of the timber was employed for shelving, flooring, lining, and weatherboarding. An acute shortage in New Zealand now precludes expansion of this trade for some time to come.

CHAPTER IX.—UTILIZATION.

Section A.—General.

77. Under pressure of the war emergency all locally-grown forest-produce has assumed a new, if in many cases a passing importance. Pre-war timbers required for special purposes and normally used in relatively small quantities could be freely obtained from the world's markets. To-day either supply, shipping, or exchange is strictly limited by war requirements either internally or externally. The same comments apply with equal force to those timbers whose bulk importation was formally governed by heavy tariffs, and to all other forms of imported forest-produce such as tannin, formalin, structural fibre-board, pulp and paper, plywood, &c. Hitherto the supply of substitute timbers and the local production of these manufactured products has been limited by economic rather than by physical considerations, but as hostilities continue, the position tends to become reversed, and every potential source of essential supplies must be thoroughly explored and, wherever practicable, exploited to the utmost.

Section B.—Industrial Investigation.

78. The National Grading Rules for building timbers continue to find increasing use throughout the Dominion, and slowly but surely out-of-date and non-standard terms and grade names are being eliminated from price-lists and specifications. As mentioned in the last annual report, the one glaring deficiency as disclosed by Forest Service arbitrations and inspections is the absence of a standard condition of sale giving purchasers the right to reject complete shipments when more than a stated percentage of the parcel is below grade. Further progress was made with standard specifications for New South Wales hardwoods at meetings of the Hardwoods Subcommittee of the New Zealand Standards Institute Timber Committee.

79. A report on the standardization of profiles for weatherboarding, flooring, and lining is also being prepared for the New Zealand Standards Institute Timber Committee, and in this connection additional samples have been collected and partial analysis made of the complete series. The elimination of wasteful effort in running these and other finishing lines to a multiplicity of designs is rendered more urgent by the war.

80. A draft standard for light timber construction has been prepared and circulated for comment by the Timber Building Code Committee of the New Zealand Standards Institute. The Department is now making investigations into heavy timber construction to enable similar progress to be made with this section of the National Building Code. Fundamental to this study is the development of structural grading rules and working stresses involving both field inspections and analysis of timber-testing results.

81. Tawa mill studies have been commenced in the Mamaku district pending further efforts to expand the markets for this timber as a substitute for imported oak. A preliminary mill study of *Pinus radiata* logs at Waipa mill yielded conversion factors varying from 6·22 for 4 in. logs up to 8·64 for 18 in. logs, the basis of reference being small-end diameters inside bark. As no salvage equipment was in operation at the time, these factors may be expected to increase as the various salvage saws work up to full production.

82. With improved kiln-drying practices and the development of successful protection treatments against insect and fungal attack, some New-Zealand-grown timbers are now finding a much wider use than previously as all-time substitutes for imported timbers. Tawa, by virtue of its wide distribution, is of considerable importance as a substitute for imported oak, especially for furniture, fittings, and interior finishings. It also promises to rank as a major plywood timber. In appearance and mechanical properties tawa resembles North American black ash, and its already proven use for clothes-pegs, turnery, handles not subject to impact, &c., indicates its suitability for a much wider range of products now that kiln drying has solved the problem of its seasoning.

Silver beech, which ranks first in production amongst the indigenous hardwoods, also commands the widest field of use. Many of its qualities are such as to commend it for numerous specialist purposes, amongst them for rifle-stocks and even for certain classes of pattern work. It is anticipated that as munitions-production extends throughout the Empire substantial quantities will be required for such work in both Australia and New Zealand, perhaps even in Great Britain, to which one shipment was made last year at the special request of the Hardwood Timber Controller.

Insignis pine, under the impact of war conditions, has already attained an importance both unique and unexpected. No other timber is filling so many roles or substituting for so many timbers in so many fields of use. Except for those few foodstuff containers such as butter-boxes in which freedom from taint is essential, insignis pine has already gained an unassailable pre-eminence in the boxing and crating industry. In the building field its most spectacular achievement has been the replacement of Californian redwood and North American western red cedar for flush-door cores and frames. The most recent wartime demand has been for peeler logs both for plywood and for the manufacture of wooden-match splints and match-box skillets. In munition-work it is being employed for ammunition-boxes, grenade-cases, motor-boxes, &c.

Still other woods are of only wartime significance in that they are either not very suitable although in plentiful supply, or very suitable but in extremely limited supply. Rimu and miro together with red and hard beech fall in the first category when required for use as large structural timbers in place of imported Australian hardwoods and North American Douglas fir. The same comment applies to red and hard beech for railway-sleepers and to rimu and matai for cheese-crate battens. Typical of the second category are tanekaha when required for aeronautical construction; manuka, kowhai, and mangeao for various classes of handles; black maire as a substitute for lignum vitæ for guide blocks in log frames; totara, silver pine, and maire for railway-sleepers; and silver pine, kawaka, and creosoted larch for telegraph and power poles. Small as the contribution may appear in the case of individual timbers, the accumulative effect is a substantial one not merely in conserving exchange funds for munitions purchases, but in maintaining essential public services and expediting the local war effort.

Section C.—Timber Mechanics.

83. Selection of local substitutes for imported timbers has in all cases been expedited whenever results of the Department's standard tests have been available, and it was therefore decided to expand these and to determine the fundamental physical and mechanical properties of all woods which might be of value in the war effort. The initial work has been concerned with Samoan-grown teak and Fijian kauri; tests on green material from the single available log of the former wood have shown that it has many excellent properties making it a suitable substitute for Burma teak for many purposes. Testing is limited to small clear specimens and is in accordance with the United States of America's plan previously used and since adopted throughout the Empire.

84. Testing of dairy-produce containers was continued as an essential contribution to the war effort. The results showed that the only way to economize the use of wire for the binding of the standard cheese-crate was to use two tensioned bindings 3 in. from each end of the crate in place of the three stapled wires now employed. For single cheese-crates $\frac{5}{8}$ in. ends were shown to be entirely practicable. Improved results were secured in the opening of rimu butter-boxes by the use of lighter nailing of the lids.

Section D.—Timber Physics.

85. Fundamental studies in wood micro-structure have perforce been subordinated to more urgent timber mechanics and physics work, but additions have been made to the departmental reference collection of slides, principally of minor indigenous woods, and routine identification work with locally-grown and imported woods was a regular feature of the year's operations.

86. Fundamental data on the specific gravity of exotic timbers from the Rotorua Conservancy has been determined, this investigation having been co-ordinated with the routine establishment and maintenance of exotic forest sample plots. Average-tree specific-gravity values for green *P. radiata* and *P. laricio* from Kaingaroa State Forest are respectively 0·350 and 0·393; within the tree variation is orthodox in both horizontal and vertical planes. Mature *P. radiata* from Waiotapu State Forest shows a variation within the tree of 0·30 to 0·55, with a mean value in excess of 0·40. Shrinkage values according to position in tree are closely related to specific-gravity variation. All specific-gravity values quoted are based upon oven-dry weight and volume green.

87. For mass tests of kiln-drying and air-seasoning stacks, the electrical moisture meters have continued to give good service. It is possible to test every board during the dismantling of a stack and thereby secure an accurate idea of the drying conditions within the stack. In the case of kiln loads suspected of uneven drying, the meter is useful in determining the offending parts of the stacks.

88. One dry-kiln installation recommencing operations after several years' quiescence was serviced by the Department, and assistance rendered to owners and operatives as required. In recent installations the advantages of permanent building construction have been recognized, and equipment is generally of good quality.

The major kiln-drying unit serviced during the year was the Department's own four-chamber installation at the Waipa State Mill. In the drying of *P. radiata* the amount of moisture to be evaporated was found to be one and a half times as great as with a green rimu load and the rate of drying of the charge to be almost twice as fast, stressing the necessity for adequate heating and ventilating capacity. Handling of the timber in 16 ft. unit packages (four to the load cross-section) permits rapid assembly and dismantling of kiln charges by means of end-lift and straddle trucks, but makes it extremely difficult to secure as accurate alignment as with ordinary hand-stacked loads. Double dry-bulb control characterizes all four kilns. The pilot kiln, which takes only one load of four unit packages, embodies an interesting feature in that the whole charge can be balanced on a weighbridge and its weight recorded at all stages of the kiln run. It is being used for the experimental drying of both exotic and indigenous timbers.

Section E.—Wood Preservation.

89. Close attention has been given to the use of all classes of wood preservatives, and it is the firm policy of the Forest Service to recommend the use of only non-proprietary standard preservatives until such time as the price of proprietary preservatives is reduced to a reasonable level and their conformity to a reasonable standard proven. Three classes of wood-preservatives have to be considered—namely, (*a*) creosotes, (*b*) volatile oil preservatives, and (*c*) water-soluble preservatives. In the first class, non-proprietary British Standard Specification creosote alone is recommended and used by the Service. Proprietary creosotes have been promoted from time to time at as much as 12s. 6d. per gallon, whereas the wholesale price of standard creosote is in the vicinity of 1s. 6d. per gallon.

The use of clean volatile oil preservatives in the treatment of building timbers against insect and fungous attack has increased rapidly in New Zealand, and as a protection against high-priced proprietary products the Forest Service has adopted minimum standards to which at least one non-proprietary preservative—namely, 5 per cent. pentachlorphenol—fully complies and is recognized by the Forest Service as a standard building preservative.

The third class—namely, water-soluble preservatives—have a very limited use under New Zealand conditions, with the exception of sapstain-preventive chemicals which are being used in increasing quantities in the protection of freshly-sawn timber. Thus at the State mill at Rotorua 592,000 board feet were chemically treated during the year with highly satisfactory results. Although the chemicals used in these treatments are proprietary products, they have been provisionally accepted as standard preservatives on account of their low and competitive prices (the cost of chemical required to treat 100 board feet of timber is approximately 2d.), of their efficacy under New Zealand conditions, and of their practically universal adoption by milling industries overseas.

Laboratory investigational work on wood preservation included development of standard methods of testing preservatives for toxicity, volatility, leach ability, solubility, and penetration; isolation and study of wood-destroying fungi; timber-durability tests; and determinations of evaporation losses in New Zealand creosotes subjected to commercial temperatures.

Progress has been made towards the standardization of priming paints for the resinous and relatively knotty exotic timbers which, it is anticipated, will be used in increasing quantities for building purposes. Aluminium powder in long oil spar varnish has been adopted as a provisional standard, and several exotic-pine cottages at Rotorua have been so treated as commercial tests.

Section F.—Derived Products.

90. Fundamental studies into the economics of local pulp and paper manufacture have been continued. Two problems of outstanding importance are under close investigation, one relating to the incidence and control of sapstains and mould on exotic pulpwoods, and the other to the seasonal variation in exotic pulpwood

extractives. A specific-gravity survey and cordwood volumetric study are also in progress. Close co-operation is maintained with North American and Australian pulp and paper authorities and with firms having experience in the manufacture of pulp and paper products from pine pulpwoods.

91. The production of charcoal for producer-gas purposes has passed through stages of rapid development and research to the present phase, which may be described as unavoidably static. Soon after the outbreak of war a Substitute Fuel Committee was set up to investigate alternatives to imported liquid fuel. Attention was immediately focused on charcoal and coal as the obvious materials, and in the absence of an established charcoal-burning industry in the Dominion, the Forest Service was instructed by the Ministry of Supply to provide sufficient charcoal for experimental uses, and to be in a position to meet substantial requirements in the event of sudden demands arising from a major curtailment of liquid fuel. Consideration was given to and research carried out on various methods of burning, including the beehive and pit methods. The concensus of local and overseas opinion was, however, in favour of the portable steel kiln, nineteen of which have been manufactured by the Railway workshops from specifications recommended by Australian and British Government authorities.

Owing to the scattered distribution of potentially-suitable timbers for charcoal-burning and the desirability of providing trained staff throughout the Dominion, units were established in the following localities: Puhipuhi (North Auckland), Rotorua, Taringamotu, and Erua (Main Trunk), Opouri (Nelson), Ngahere (West Coast), Darfield and Hanmer (Canterbury), and Fairfax (Southland). A total of 62 tons was manufactured from the following species: Rimu, matai, silver and hard beech, manuka, maire, tawa, rata, wattle, and several species of eucalypts. During the year 403 cords of wood were burnt for charcoal. The average yield of screened charcoal from one cord of wood was 500 lb., ranging from 350 lb. (rimu) to 800 lb. (maire). In comparison with high-density Australian timbers, these yields are low; thus the New South Wales Forestry Commission reports that the average yield of screened charcoal from white box and red mahogany is 840 lb. and that of ironbark not less than 1,100 lb. per cord of wood. Such high yields cannot be obtained from the relatively low density timbers available for charcoal in New Zealand. Whilst a satisfactory grade of charcoal may be produced from all the woods tested, preference is naturally given by consumers to the denser charcoals such as maire and manuka.

To ensure that only high-grade charcoal would be supplied to users of producer-gas vehicles, a charcoal specification was adopted, and private manufacturers of charcoal for sale were licensed under Supply Control Emergency Regulations 1939. Eleven companies or private individuals have been issued charcoal-burning licenses, but the quantity of charcoal sold by these licensees for producer-gas is believed to be very limited. Only 20 tons of Forest Service charcoal were sold during the current year. This poor demand has been due to three causes: (*a*) High price of charcoal, (*b*) adequate quantities of relatively low priced coal-fuel derivatives in the form of " Waikato char " and activated coke, and (*c*) availability of liquid fuel.

A price of £15 per ton at main centres was fixed for State Forest charcoal, and subsequent experience has shown that a satisfactory grade of charcoal cannot be produced economically at a lower figure, owing to the high fuel-wood value of the timbers yielding the best charcoal, and high freight costs and wages. Although £15 per ton is equivalent to petrol at 2s. per gallon, petrol is still available and therefore preferred, and the output of coal-fuel derivatives at less than half the cost of charcoal is more than sufficient for the 1,000-odd producer-gas vehicles at present operating in the Dominion. Consequently, there is little inducement for users of producer-gas vehicles to adopt charcoal on even a small scale at the present time.

Having, it was considered, achieved the primary objective—namely, the establishment of a charcoal organization which could be rapidly expanded to meet wartime eventualities—the continued lack of demand for the standard produce has finally necessitated curtailment of production. Until conditions alter, production will be largely limited to the Department's own requirements for its producer-gas-equipped vehicles. Stocks at the end of the period total 36 tons.

CHAPTER X.—MISCELLANEOUS.

Section A.—Legislation and Regulations.

92. Section 20 of the Reserves and other Lands Disposal Act, 1940, cancels the reservation as endowments for primary education over an area containing 278 acres 3 roods 3 perches in Otago Land District, being Section 1, Block V, and Section 1, Block VI, Rankleburn Survey District, and reserves the land as permanent State forest under and subject to the Forests Act, 1921–22. The land is an addition to the Blue Mountains State Forest.

Section 7 of the Finance Act, 1940, empowers the Minister of Finance to borrow an additional £1,000,000 for the purposes of the Forests Act, 1921–22.

Forest (Fire-prevention) Regulations 1940 (Serial number 1940/246): These regulations, made pursuant to the provisions of the Forests Act, 1921–22, came into force on the 27th September, 1940. They consolidate existing regulations and provide further administrative machinery which experience has shown to be necessary in safeguarding State forests.

Section B.—Finance.

93. Summaries showing payments and receipts from State Forests Account, together with comparative figures for the previous three years, are returned as Appendix XII. The final audited accounts will appear in accordance with Treasury requirements in parliamentary paper B.–1 [Pt. IV].

Allocations of revenue to the Consolidated Fund and to local bodies are an index of increased timber sales, and increased salaries and general expenses likewise reflect needful additions to staff and the expanding cost of timber-control activities. Not unexpectedly, exotic-forest expenditure shows a marked reduction as a result of the ever-increasing labour shortage, although indigenous expenditure has increased as a result of logging developments in connection with the war effort. The utilization item includes both capital and operating charges which will be reflected next year in very large increases in revenue.

With privately-owned forests being cut out much more rapidly than State forests, there is an ever-increasing demand for State-owned stumpage, and this is reflected in timber sales for the period. The fall in permit revenue is due to the labour shortage and is expected to continue. The increase in log sales is accounted for by expanded production of white-pine for butter-boxes and of kauri for mine-sweeper construction. The large increases in utilization items are the first results of the sawmilling and creosoting activities, but represent only a fraction of a full year's operation and will therefore continue to show substantial gains.

94. Under various statutes provision is made for the payment of portion of revenues received from timber royalties, &c., and the following table shows the authority and the payments made from revenues collected by the Forest Service :—

Year	Consolidated Fund (under Section 39 of Forests Act, 1921–22).	Local Authorities (under Section 17 of Finance Act, 1924).	Local Authorities under Section 6–7 of Forest Amendment Act, 1926–27.	Total.
	£	£	£	£
1938–39 ..	18,712	14,191	5,825	38,728
1939–40 ..	14,416	13,202	8,278	35,896
1940–41 ..	16,151	16,593	7,075	39,819
Total for three-year period	49,279	43,986	21,178	114,443

Local bodies, particularly in heavily-timbered counties, benefit considerably from the timber industry. The authorities and approximate amounts paid where timber stands are under the control of the Service are as follows :—

Statute Reference.	Proportion of Revenue Payable.	Approximate Annual Value.
		£
(1) Section 17, Finance Act, 1924	One-fifth of the net revenue received from sales of Native timber growing on State forests	18,000
(2) Section 6–7, Forests Amendment Act, 1926	Either 90 per cent. or 50 per cent. according to land status (usually referred to as goldfields revenue timber royalties)	7,000
(3) Section 357, Land Act, 1924	Halves of royalties paid for timber removed from Crown lands	Unknown. Under control of Lands and Survey Department.
(4) Section 28, Finance Act, 1927 (No. 2)	Local authority may levy up to ½d. per 100 board feet for all Native timber cut within the county boundaries and may in addition recover damages to roads caused by timber traffic	Unknown.

It is, of course, inevitable that the disbursements from Forest Service revenue can only be replaced by increased loan-moneys.

Section C.—Recreation.

95. The number of authorized visitors to State forests for recreational purposes showed a decline on previous years and is no doubt a reflection of the war activities which are now occupying the time of many members of tramping clubs and kindred societies and others who in normal times enjoy in full measure the healthful attractions of the forest. Recognized camping-areas in State forests reasonably convenient to centres of population were enjoyed by moderate numbers, except in the case of a conveniently-located camping-ground in Southland where an increase in the number of visitors is recorded, 100 camping permits being issued, as against 82 last year.

It is, however, regretted that unauthorized visitors are still prevalent and cause forest officers a great deal of anxiety in the performance of their duties, particularly in regard to fire control. However, under Regulation 12 of the Forest (Fire-prevention) Regulations 1940 it is now an offence punishable by a maximum fine of £50 or three months imprisonment to enter a State forest without a permit from a Forest officer. The regulations mentioned also provide that any person in a State forest or fire district must do his utmost to suppress any outbreak and also to report the occurrence to the nearest forest officer.

Section D.—Opossum-trapping.

96. Permits to enter State forests to trap opossums during the 1940 season numbered 143. These permits are tenable for one season only and authorize a trapper to occupy a specified block of State forest; the right to trap is granted by license issued pursuant to the Opossum Regulations 1934 under the Animals Protection and Game Act, 1921–22. Although the number of permits issued exceeded the 1939 total by 22, it shows a sharp decline when compared with the figures for the 1938 season—viz., 263.

Damage to exotic trees by opossums was reported from five localities, and the destruction of the animals in the areas affected was carried out under warrants issued in that behalf by the Minister of Internal Affairs.

Section E.—Mining Privileges.

97. In all, 133 applications for mining privileges under the Mining Act, 1926, and 7 applications for coal-mining rights under the Coal-mines Act, 1925, were considered, and reports furnished to the Warden. Certain privileges under the Mining Act, 1926, require the consent of the Commissioner of State Forests before

licenses can be granted, and by arrangement with the Mines Department all applications affecting State forests are referred to this Service for investigation before being dealt with by the Warden's Court. Applications for rights in State forests under the Coal-mines Act, 1925, also require the Commissioner's consent before they can be granted, and in no case was consent withheld.

In the interests of forest conservation and management, all applications are carefully scrutinized and sympathetic consideration given to legitimate mining, but the attention of applicants affected is directed to section 23 of the Mining Amendment Act, 1934, which empowers the Commissioner to claim compensation for damage done by mining operations. Several hundred additional applications for mining privileges were also received, but examination revealed that they did not affect State forests.

By arrangement with the Mines Department, a notice was published in *Gazette*, 1940, page 1661, pursuant to section 20 of the Mining Act, 1926, exempting an area of State forest containing 1,100 acres in Gap Survey District, Southland Land District, from all provisions of the Mining Act, 1926, and regulations, affecting the rights of privilege-holders to cut and use timber.

Section F.—Forest Grazing.

98. A total number of 202 grazing leases, of which 10 were for terms exceeding one year, covering in all a total area of 181,290 acres, were in force at the 31st March, 1941. Except in special circumstances, grazing rights of a temporary nature only are granted and are allowed to continue for such periods as are not detrimental to forest management or until the land is required for other State forest purposes.

Co-ordination of legitimate forest uses with ordinary agricultural grazing practices is not always simple, and it is feared that graziers only too frequently feel that forest restrictions are designed purposely to restrict agricultural profits. It must, however, always be borne in mind that if land is proclaimed as State forest, grazing can never be more than an emergency activity, justifiable only so far as it furthers true forest interests—*e.g.*, by keeping down heavy growth it may lessen fire hazard.

Section G.—Government Timber Price Committee.

99. The Government Timber Price Committee, consisting of officers of the Department of Industries and Commerce and of the New Zealand State Forest Service, ceased to function during the year, its responsibilities in connection with the supervision of timber-prices having been wholly assumed by the Price Tribunal. The services of specialist departmental officers, however, were made available as desired to assist the Tribunal in its investigations into the prices of timber and other forms of forest-produce, including paper products.

With cessation of its activities, it is appropriate to record that the Committee, by its implementation of Government policy that from 1936 onwards increases in the price of timber should be limited to proven increases in production costs, effected savings to the purchasing public which, on the most conservative estimate, amounted to £150,000 per annum—a benefit and saving which still continues. Through elimination of waste in manufacture, other substantial savings amounting to at least £30,000 per annum were effected by standardization of timber-cutting practices and of butter-box manufacture.

Section H.—Rehabilitation.

100. The Forest Service is represented on the Rehabiliation Secretariat set up by the Government during the year and attached to Treasury. As visualized in the policy statement of last year's annual report, it is believed that long-range planning is essential if the Forest Service is to make its contribution to rehabilitation as economical as it may be substantial. The principal items in the Forest Service contribution must be, first, the overtaking of accumulated arrears in silvicultural treatment principally of the exotic forest, but also of some of the indigenous stands; secondly, the wider utilization of the exotic forest for all classes of products ranging from sawn timber to pulp and paper; and thirdly, the establishment of local exotic forests in timberless districts and of counter-erosion forests to demonstrate promising erosion-control measures.

One problem which is common to all three developments—that of accommodation—is of outstanding importance. The basic objective of rehabilitation is to restore soldiers to a normal condition of living of which home and married life are the embodiment. It is therefore essential that married accommodation should be provided for as many as can be permanently employed on all projects, and to this end the Forest Service is investigating the possibilities of manufacturing prefabricated structures in its own plants as a means of conserving skilled building labour and expediting the completion of its housing requirements as soon as possible after the cessation of hostilities.

While general preparatory work is not of major significance in the case of the accumulated arrears of silvicultural work, the reverse applies to the development of utilization activities, and even more so to the establishment of new forest units and counter-erosion areas. The Department is taking urgent action accordingly, and already four new forest units and one counter-erosion block have been located, with the search continuing steadily for others in appropriate districts. If these are to be developed to their maximum as avenues of rehabilitation employment, their early purchase becomes all-important. Hasty planning can only spell economic and silvicultural disaster, as in the case of so many areas in the last post-war era; and surveys, arrangements for seed-supplies, general planning work, and the erection of some accommodation must, as far as practicable, be completed during the war, in order that fencing, roading, firebreak-construction, and nursery and planting work may swing into the earliest operation after the war. Similar preparatory work is being undertaken in connection with utilization activities.

Section I.—Timber Emergency Legislation.

101. While more activities required formal action through public notices than during the preceding year, practically the whole of the work in connection with the Timber Emergency Regulations was carried out by co-operation and negotiation with the sawmilling, boxmaking, building, and other industries.

102. Both Public Works Department and private contractors were given priority of supply for all classes of defence works, and, with negligible exceptions, supplies were available as and when required. The basic policy in respect to economy has been to allocate cheap slow-moving stocks not generally used for ordinary civil building purposes for all defence works of either a temporary or semi-permanent nature. Only in the case of permanent buildings has any departure from this policy been agreed to. This has been implemented by a rigid inspection of all specifications and appropriate directions to Government Departments, contractors, and suppliers. Further economy has been achieved by directing wherever possible that timber for defence works is purchased direct from mills, the Government receiving the same discounts as allowed to timber-merchants for their bulk supplies.

Generally speaking, timber requirements for munitions have been extremely small, although there is every indication that these will increase in the near future. Supplies and inspections have been undertaken as desired.

The recently-concluded arrangements for the shipment of food and beer, &c., to the Middle East theatre of war have necessitated arrangements for the delivery of 15,000,000 board feet of timber, largely rimu and matai, as supplies of the usual boxing timbers have become so acute as to necessitate their allocation to more essential purposes.

Arrangements for the supply of kauri for the construction of mine-sweepers were concluded during the year. Stocks of suitable sizes were unfortunately extremely low, and for a great part of the material this necessitated the selection and delivery of special logs from State forests to supplying mills.

103. It has been the general policy of the office of the Timber Controller to conserve the best and most suitable supplies of building timber for normal civilian building requirements, most of which are of a permanent nature. This policy, it will be observed, has been largely implemented by the practice previously referred to of securing defence requirements direct from mills, leaving intact as far as possible the merchants' stocks of better grades in both seasoned rough and finished timbers.

Due to the rapidly-changing conditions which have ruled in the various produce markets since the beginning of the war, considerable difficulty has attended the maintenance of adequate supplies of boxes and other containers for all classes of goods but more particularly for export dairy-produce. With butter-production sky-rocketing for the latter half of 1940 to over 20 per cent. in excess of the budgeted production, supplies of butter-box timber could only be obtained by the adoption of a number of extraordinary measures ranging from the use of dry kilns for seasoning green stock to the working of extra hours in supplying mills and box-factories. Incidentally, it should be noted that this switching of operations from a forty- to a forty-eight-hour basis was attended with considerable difficulty in some mills; in fact, so much so that it proved quite impracticable in a number of cases. Except in the North Island white-pine mills, this forty-eight-hour week has since been abandoned owing to the fact that export-butter production for next season has been curtailed to 110,000 tons, representing only a little over 75 per cent. of the current season's export production.

Cheese-production during the current season has likewise expanded, and whilst crates have been forthcoming to pack the produce, it has been necessary to use timbers not altogether suitable for the purpose. With a planned increase in production from the current season's level of 120,000 tons to 160,000 tons, an extremely acute difficulty has arisen. Whilst numerous timbers may be employed as battens, only two species—white-pine and insignis pine—can be used for ends and centres. The whole of the white-pine supplies, however, are absorbed for butter-boxes and tallow-casks. As to insignis pine, the ever-increasing use of this timber for the ordinary boxing of domestic merchandise had already absorbed all available supplies prior to the current season. In effect, this means that the whole of the insignis pine required for the ends and centres of crates for the extra 40,000 tons of cheese can only be obtained by strict control of all insignis-pine supplies, and this accordingly is being instituted.

Prior to the war, probably over 90 per cent. of the Dominion's pole requirements was secured from Australia, the remainder consisting largely of silver-pine poles secured from the Westland and Main Trunk districts. To relieve the shipping position and conserve exchange funds, every effort has been made to expand the production of local poles, and this has been largely achieved by the use of creosoted larch poles. A similar position existed in respect to the supply of railway-sleepers, local supplies being even smaller than in the case of poles. The New Zealand Railways, however, have now signified their willingness to accept red and hard beech sleepers in addition to those formerly purchased and are prepared to pay a remunerative price in order to expand local supplies. Assistance by way of tree selection and inspection is being afforded by the Forest Service.

104. The Office of the Timber Controller has been vitally interested in shipping priorities, more particularly in the case of coastal craft, since the North Island butter industry is largely dependent on South Island white-pine and rimu supplies from Westland. Wellington also is largely dependent upon Westland for rimu building-timber supplies while small amounts of Southland silver beech are shipped to the North Island. With the transfer of numerous coastal vessels to naval work, a real shortage of coastal tonnage has been created. This became evident early in 1940, but subsequently, as a result of a conference with all interests affected, the Timber Controller was assured of sufficient tonnage to move the whole of the essential butter-box requirements, and this undertaking has been honoured ever since by coastal shipping interests. Tonnage likewise has been provided for both the Wellington rimu building-timber requirements from Westland and the North Island beech requirements from Southland, although as a temporary measure tonnage allocations for West Coast building timbers have been transferred to the Coal Controller.

105. In accordance with the general direction of the Government that every effort must be made to conserve both exchange funds and shipping space, a rigid control has been maintained over the importation of all classes of forest-produce, this being effected through the Import Advisory Committee, to which the Office of the Timber Controller acts in an advisory capacity. Generally speaking, all timber imports have been reduced to about one-third of their pre-war level, and current importations now represent little more than essential requirements which cannot be replaced by locally-produced substitutes. It is not improbable, however, that

further reductions will be effected by the shortage of supplies in the exporting countries. Essential to this control policy, of course, has been the conservation of existing stocks and new deliveries of all imported timbers. This has been effected both by public notices under the Timber Emergency Regulations, as, for instance, in the case of both North American Douglas fir and Californian redwood, the use of which is restricted to a number of stated purposes, and by negotiation with the various importing and consuming interests.

The policy has been to release timber for export only after all domestic requirements have been met. The control is actually carried out by the Comptroller of Customs, the Office of the Timber Controller acting in an advisory capacity on all applications for permits to export. Most of the export takes place from Greymouth, with odd shipments from North Auckland and Southland ports. Some expansion of export was made possible by zoning the Dunedin market away from Westland suppliers to Southland and Otago mills, which were operating at only a fraction of their capacity, and thereby expanding the amount of timber available from Westland mills for shipment to Australia. Various proposals have been made by Australian interests for the further expansion of the New Zealand export trade, but unfortunately the kinds and classes of timber acceptable to the Australian consumer are those which are already in short supply in New Zealand. Any proposal to solve the problem by extended hours of working tends to be negatived by the fact that the non-acceptable classes of timber produced incidental to the acceptable qualities would be difficult to market in New Zealand. As to the kinds of timber already in short supply, all North Island white-pine mills are already working extended hours, and the log-supplies of this species and of insignis pine are of such a limited nature that to allow their export this year would only accentuate the Dominion's own local shortage next year.

106. It has been the purpose of production control to maintain as far as practicable a balance between supply and demand. Such control as it has been deemed advisable to effect has been limited to departmental action by the State Forest Service in withholding bush areas from sale wherever supply appeared to be well in excess of demand either current or potential. There is, however, power to extend this control to timber in all other ownerships, the precedent consent of the Timber Controller being required to all sales of standing timber. To date no precedent consents have been withheld, but it is not unlikely that the Timber Controller may be compelled to withhold his consent as hostilities continue and demand tends to seriously contract. Reference has already been made to the zoning away of Dunedin markets from Westland to Southland and Otago mills in order to improve the operating ratio of these latter. Admittedly some slight inconvenience has been imposed on the Dunedin consumers in that the Southland and Otago timber is not as easy to work or use as the West Coast timber, but the arrangement has had the desired effect of keeping mills in full production and expanding export. As hostilities proceed, it is not improbable that similar action may be necessary in other districts.

A still further feature of production control has been the direction of distribution both on a regional basis and as between individual producers and purchasers. An example of the former arose out of the recent temporary transfer of building timber tonnage priorities for Wellington to the Coal Controller. Wellington being compelled to forego its usual West Coast supplies, it was necessary to make arrangements for additional export shipping of this timber to Australia and at the same time to negotiate arrangements between the Wellington timber-merchants and the North Island Main Trunk and Rotorua line sawmillers whereby all North Island markets shared this shortage. The purpose of controlling distribution in the case of individual producers and consumers has been to ensure an adequate supply of timber for essential manufacture, as in the case of white-pine for butter-boxes and insignis pine for cheese-crate ends. The basic policy in connection with such allocations has been one of economizing freights both on the sawn-timber supplies and the manufactured box-shooks.

107. Supplies of wire ropes and saws are of such fundamental importance to the timber industry and of corrugated fasteners and binding-wire to the boxmaking and using industries that periodical reviews of stocks have been made by the Office of the Timber Controller. Some of the larger units in all of the industries concerned

had ample stocks at the outbreak of hostilities, but few, even though import licenses were issued, have been successful in maintaining this position. The stocks of wire ropes in particular commenced to give some concern to the Office of the Timber Controller almost twelve months ago, but for some time afterwards assurances were received that adequate supplies would be released from Australia. By the end of 1940, however, the position had deteriorated so badly that urgent recommendations were made for the creation of a national reserve of logging-wire rope, and this is now in process of being created, in addition to allowing the issue of ordinary import licenses. More recent developments indicate that similar action should be taken in reference to saws, corrugated fasteners, and binding-wire, and a national survey of all four items is now being undertaken.

108. The following public notices were issued under the Timber Emergency Regulations 1939 :—

(*a*) Notice regulating the disposal of oregon or Douglas fir and redwood. This notice was published in the *New Zealand Gazette*, No. 32, of the 11th April, 1940, page 705, to ensure in the interests of conserving exchange funds that the timbers mentioned were used for essential purposes only.

(*b*) Notice controlling the manufacture and sale of cheese, apple, and pear crates and cases was published in the *New Zealand Gazette*, No. 70, of the 4th July, 1940, page 1626, for the purpose of assuring economic manufacture and distribution of the containers mentioned.

(*c*) Notice restricting the export of kauri and insignis pine was published in the *New Zealand Gazette*, No. 74, of the 18th July, 1940, page 1724, to ensure that local demands for these timbers received priority over export.

(*d*) The Charcoal Manufacture and Sale Notice 1940 was published in the *New Zealand Gazette* of the 10th October, 1940, and provided for the licensing of charcoal manufacture for sale. This was to give control in respect of the quality of charcoal manufactured for sale.

(*e*) The Southland and Otago Cheese-crates Order 1940 was published in the *New Zealand Gazette*, No. 109, of the 31st October, 1940, and was introduced to stabilize manufacture and distribution of export cheese-crates in Southland and Otago.

(*f*) Notice prohibiting the sale of Westland timber in the Southland and Otago Land Districts was published in the *New Zealand Gazette*, No. 121, of the 28th November, 1940, page 3501. This was to assure the Southland and Otago sawmillers of a market capable of absorbing their production and at the same time to permit West Coast sawmillers to release the maximum possible quantities of rimu for export.

(*g*) The Southland and Otago Silver Beech Marketing Notice 1940 was published in the *New Zealand Gazette* of the 19th December, 1940, and provided for the control of the production and marketing of Southland silver-beech timber with the object of developing the local use of the timber as a wartime substitute for imported woods.

Section J.—Export Butter-box Pool.

109. The Service again co-operated with the New Zealand Dairy Board in the purchase and distribution of export butter-boxes for the North Island export butter-box pool. Before the opening of the season it was estimated that butter-production during the 1940–41 period would show a 5-per-cent. increase above the 1939–40 output, but for the first five months alone 3,135,000 boxes were required, representing an increase of 16 per cent. over the demand for the corresponding period of the 1939–40 season. As reserve stocks of boxes had been used to pack the abnormally high autumn production of the 1939–40 season, it was necessary to work overtime in sawmills and box-factories and to undertake the kiln drying of timber in order to supply factories' needs. The number of export butter-boxes manufactured during the year ended 31st March, 1941, was 5,300,000, compared with 4,600,000 during

the previous year—4,300,000 boxes were of white-pine and 1,000,000 of rimu. During the year there was delivered for butter-box manufacture in North Island factories 9,500,000 board feet of white-pine and 4,500,000 board feet of rimu from the South Island, and 13,500,000 board feet of white-pine from North Island sources.

Section K.—Commercial Afforestation Companies.

110. Inquiries concerning the operations of commercial afforestation companies continue to be received; these should be addressed to the Commissioner of Stamp Duties, Wellington C. 1.

In the *Monthly Abstract of Statistics*, February, 1941, the Government Statistician has furnished the information that at 31st March, 1940, the total area planted by these companies was 310,441 acres. New planting has again been on a reduced scale, and during the winter of 1940 it is understood that an area of 163 acres in North Auckland was the only new area planted, making a total of 310,604 acres.

APPENDIX I.

Changes in State Forest Areas, 1st April, 1940, to 31st March, 1941.

Conservancy.	Additions.			Deletions.			
	Permanent State Forest: Ordinary.	Provisional State Forest: Ordinary.	Totals.	Permanent State Forest: Ordinary.	Provisional State Forest.		Totals.
					Ordinary.	National Endowment.	
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Auckland ..	3,867	3,658	7,525	49	233	..	282
Rotorua ..	833	1,267	2,100	..	..	..	..
Wellington ..	83,621	..	83,621	..	..	..	..
Nelson ..	14,045	1,720	15,765	..	..	..	..
Westland ..	146,996	4,680	151,676	..	1,239	1,315	2,554
Canterbury ..	53,168	..	53,168	48	..	..	48
Southland ..	598	..	598	21	..	..	21
Totals ..	303,128	11,325	314,453	118	1,472	1,315	*2,905

* All withdrawn for settlement purposes.

APPENDIX II.

Area of State Forest as at 31st March, 1941, and Progress of Reservation of State Forests, 1921–41.

Conservancy.	Permanent State Forest.		Provisional State Forest.		Totals.	Percentage of Land Area under State Forest Reservation.
	Ordinary.	National Endowment.	Ordinary.	National Endowment.		
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Auckland ..	388,248	89,789	127,527	14,006	619,570	7·21
Rotorua ..	623,226	289,939	136,319	63,108	1,112,592	14·09
Wellington ..	973,642	37,308	27,463	7,634	1,046,047	8·65
Nelson ..	754,659	177,573	884,215	586,228	2,402,675	34·29
Westland ..	942,414	354,110	360,449	230,762	1,857,735	48·08
Canterbury ..	486,260	3,647	..	..	489,907	4·92
Southland ..	529,678	56,234	633,901	13,740	1,233,553	7·27
Totals as at 31st March, 1941	4,668,127	1,008,600	2,169,874	915,478	8,762,079	13·20
		Percentage of Total.		Percentage of Total.		
Totals for 1941	5,676,727	64·8	3,085,352	35·2	8,762,079	13·20
Totals for 1936	4,043,693	51·1	3,866,479	48·9	7,910,172	11·91
Totals for 1931	2,126,837	27·4	5,634,329	72·6	7,761,166	11·69
Totals for 1926	1,866,990	24·7	5,686,700	75·3	7,553,690	11·38
Totals for 1921	1,668,319	24·5	5,134,651	75·5	6,802,970	10·25

APPENDIX III.

SUMMARY OF PLANTING AND SILVICULTURAL OPERATIONS IN STATE FORESTS AS AT 31ST MARCH, 1941.

Project.	Year of Commencement.	Gross Area of Forest.	Total Net Area planted.	New Area planted, 1940.	Area pruned, 1940–41.	Area thinned, 1940–41.	Area Clear-felled, 1940–41.
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Mangonui	*	8,927	..	..	..	..	..
Waipoua	1925	12,600	2,773	580	42	..	..
Puhiphui	1904	1,565	1,209	4	14	14	..
Riverhead	1926	11,965	10,591	..	335	..	..
Tairua	1930	48,510	12,910	335	10	..	..
Kauaeranga	1940	4,000	277	277	..	..	..
Maramarua	1928	14,087	12,311	..	361	..	..
Rotochu	1937	31,235	3,592	1,845	..	..	..
Whakarewarewa ..	1898	10,065	8,033	..	57	57	84
Waiotapu	1901	7,974	7,051	..	144	148	47
Kaingaroa	1913	328,667	258,968	..	5,086	41	..
Tongariro	1937	4,500	1,897	320	..	..	..
Erua	1930	6,648	4,305	..	8	..	..
Karioi	1927	33,689	17,195	..	198	..	..
Masterton	*	..	..	..	..	..	..
Golden Downs ..	1927	27,815	21,220	126	531	1,589	..
Westland	1922	5,839	3,090	..	20	..	..
Hanmer	1901	10,372	7,784	..	..	76	..
Balmoral	1916	24,141	21,264	22	107	..	..
Eyrewell	1928	19,266	17,243	..	1,173	..	..
Ashley	1939	4,901	899	504	..	..	..
Naseby	1900	4,032	3,098	..	110	32	..
Dusky	1898	6,866	4,470	..	256	318	..
Conical Hill	1903	3,906	3,605	..	85	29	7
Pukerau	1915	628	565	..	..	..	..
Blue Mountains ..	1925	10,058	8,872	50	275	209	..
Pebbly Hills	1930	5,330	4,341	..	442	..	..
Minor Areas	1875–1939	14,322	2,241	392	149	5	..
Totals	..	663,626	439,804	4,455	9,406	2,518	138

* New projects.

APPENDIX IV.

SUMMARY OF PERMANENT ESTABLISHMENT AND NEW WORKS CARRIED OUT, 1940-41.

Conservancy.	Roads.		Firebreaks.		Telephone-lines.		Surveys, 1940–41.				Fire Lookout Buildings.
	Completed, 1940–41.	Total.	Formed, 1940–41.	Total.	Erected, 1940–41.	Total.	Topographical.	Compartment Layout.	Timber Appraisal.	Timber Reconnaissance.	
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Acres.	Acres.	Acres.	Acres.	
Auckland ..	6	80	39	243	2	96	..	..	3,350	..	4
Rotorua ..	20	614	24	288	8	140	6,316	1,300	8,902	..	8
Wellington ..	..	61	4	34	1	16	..	1,517	1,414	..	4
Nelson ..	..	30	3	92	..	27	200	..	1,555	..	2
Westland ..	..	..	..	10	..	2	..	..	3,291	1,679	1
Canterbury ..	3	195	8	295	5	45	..	..	..	..	3
Southland ..	6	86	..	196	4	45	..	..	3,537	..	2
Totals ..	35	1,066	78	1,158	20	371	6,516	2,817	22,049	1,679	24

APPENDIX V.

FIRES OUTSIDE STATE FORESTS, 1940–41, DEALT WITH BY FOREST SERVICE.

Date.	Conservancy.	Area.	Origin of Fire.	Cost of Fire-fighting.	Remarks.
		Acres.		£ s. d.	
10/7/40	Westland ..	..	Unknown	..	40 chains from boundary of Compt. 12, Rimu State Forest.
5/8/40	Wellington ..	0·75	N.Z.R. locomotive ..	0 18 0	Grass and fern in Railway reserve.
4/9/40	,, ..	0·20	,, ..	0 3 0	,,
12/9/40	,, ..	1·5	,, ..	0 9 0	,,
13/9/40	,, ..	7·0	,, ..	0 5 0	Tussock in Railway reserve.
19/9/40	Westland ..	..	Unknown	..	60 chains from boundary, Rimu State Forest.
13/10/40	Wellington ..	50·0	,, ...	1 16 0	Scrub and tussock in Native-owned land.
15/10/40	Auckland ..	40·0	Carelessness	2 14 0	Bracken and 50 fencing-posts, value £5.
17/10/40	Wellington ..	0·5	N.Z.R. locomotive ..	2 5 0	Scrub and fern, Railway reserve.
22/10/40	,, ..	25·0	,, ...	0 2 6	Road reserve.
22/10/40	,, ..	95·0	Unknown	7 7 0	Tussock and bush edge, National Park reserve.
30/10/40	,, ..	0·25	N.Z.R. locomotive ..	..	Railway reserve.
12/11/40	,, ..	..	,, ..	0 2 6	..
13/11/40	,, ..	1·0	,, ..	0 4 6	Tussock in Railway reserve.
13/11/40	,, ..	..	,, ..	0 2 0	,,
13/11/40	,, ..	0·5	,, ..	0 4. 6	Scrub in Railway reserve.
16/11/40	,, ..	0·1	,, ..	0 4 0	,,
16/11/40	,, ..	1·0	,, ..	0 2 0	,,
16/11/40	,, ..	2·0	,, ..	0 15 0	,,
16/11/40	,, ..	0·5	,, ..	0 2 0	,,
16/11/40	,, ..	0·5	,, ..	0 2 0	,,
16/11/40	,, ..	0·5	,, ..	0 2 0	,,
29/11/49	,, ..	1·5	,, ..	1 0 0	Flax, &c., in National Park.
30/11/40	,, ..	1·5	Unknown	..	Tussock on Native land.
6/12/40	,, ..	0·5	N.Z.R. locomotive ..	0 9 0	,,
12/12/40	Rotorua ..	3,000·0	Unknown	33 6 10	Fern and scrub, &c.
12/12/40	,, ..	60·0	,, ...	13 7 11	30 acres young timber, 15 acres mature timber, 15 acres grass.
13/12/40	Wellington ..	2·0	N.Z.R. Locomotive ..	3 0 0	Tussock in National Park.
27/12/40	Canterbury ..	110·0	Unknown	..	Pine trees in Selwyn Board's plantations.
30/12/40	Wellington ..	40·0	,, ...	1 10 0	Native land—bracken.
3/1/41	Nelson ..	80·0	,, ...	100 2 0	Beech forest—40 acres regeneration. Crown land.
8/1/41	Southland ..	10·0	Settler burning off ..	..	Tussock.
12/1/41	Auckland ..	..	,, ..	3 12 9	Fern, &c.
13/1/41	Wellington ..	20·0	Grass fire	..	10,000 17-year *P. radiata*, value £1,000, on private land.
14/1/41	,, ..	..	Unknown	..	R. N. Speirs' mill, Foxton. £480 damage—dry timber.
18/1/41	,, ..	0·1	N.Z.R. locomotive ..	0 2 0	Tussock on Railway Reserve.
11/2/41	,, ..	..	Spark from smoke-stack ..	..	10,000 board feet white-pine—Owhango Box-factory.
9/2/41	Canterbury ..	..	Unknown	1 11 5	Scrub on private land.
14/2/41	Rotorua ..	1·0	,, ...	..	..
14/2/41	,, ..	250·0	,, ...	2 17 3	Scrub.
3/3/41	Auckland ..	..	Settler's fire out of control ..	1 8 3	,,
5/3/41	Southland ..	..	Unknown	..	Glenburn Timber Co.'s mill destroyed.
7/3/41	Wellington ..	20·0	,, ...	10 12 0	Sawdust heaps, &c., in Horopito.
8/3/41	,, ..	10·0	,, ...	7 10 0	Scenic reserve in Pohangina Valley.
20/3/41	Westland ..	0·5	,, ...	..	Manuka and second growth in scenic reserve.
12/3/41	Wellington ..	0·5	N.Z.R. locomotive ..	0 2 6	Five separate fires within half a mile.
Total	(46 fires) ..	3,833·9		198 11 11	

APPENDIX VI.

FIRES IN STATE FORESTS, 1940–41.

Date.	Conservancy.	Forest No.	Area Burned.	Origin of Fire.	Cost of Fire-fighting.	Remarks.
			Acres.		£ s. d.	
17/4/40	Auckland ..	S.F 13	3·3	Burning-off operations	0 13 6	*P. palustris* burned and scorched.
16/6/40	Rotorua ..	,, 1	..	Carelessness	..	Hut damaged.
10/7/40	Westland ..	,, 17	..	Unknown	..	..
16/9/40	Wellington ..	,, 100	1,000	,, ...	4 10 0	Tussock area burned over.
23/9/40	Nelson ..	,, 187	0·2	Burning-off operations	0 15 0	100 11-year *P. radiata* scorched.
31/10/40	Southland ..	,, 93	3·5	Unknown	..	Tussock.
3/12/40	,, ..	,, 10	10	Accidental	0 15 0	Fern.
3/12/40	,, ..	,, 10	1	Unknown	..	Fern and grass.
23/12/40	,, ..	,, 10	10	Settler burning off ..	..	Fern.
27/12/40	Canterbury ..	,, 86	1,158	Unknown	285 19 5	Comps. 24, 25, 26, and 33 destroyed. Book value, £14,000.
28/12/40	Southland ..	,, 10	320	Settler burning stumps	..	200 acres grazing, 120 acres fern.
29/12/40	,, ..	,, 10	30	Land-clearing ..	..	..
1/1/41	Wellington ..	,, 42	14	N.Z.R. locomotive ..	8 5 0	Fern and 14 dead trees.
5/1/41	Southland ..	,, 10	30	Unknown	..	20 acres grazing.
5/1/41	,, ..	,, 10	..	,, ...	..	..
5/1/41	,, ..	,, 10	3	,, ...	..	..
6/1/41	,, ..	,, 10	..	,, ...	..	..
7/1/41	,, ..	,, 10	60	Steam locomotive ..	..	..
8/1/41	,, ..	,, 10	30	,, ..	..	..
10/1/41	Rotorua ..	,, 3	..	Spark from locomotive..	..	No material damage. Extinguished by rain.
10/1/41	,, ..	,, 31	..	,, ..	..	Ditto.
11/2/41	,, ..	,, 41	..	Carelessness	..	Police cautioned offender.
21/2/41	Auckland ..	,, 150	290	Unknown	25 0 0	Heavy scrub.
25/2/41	,, ..	,, 97	6·5	Locomotive	..	Fire-fighting costs paid by private company.
4/3/41	Nelson ..	P.S.F. 104	0·6	Blasting operations ..	..	Extinguished by P.W.D. employees.
4/3/41	Southland ..	,, 53	620	Unknown	..	Cut over bush. Extinguished by rain.
11/3/41	,, ..	,, 37	42	Spark from hauler ..	..	Cut over bush; 2½ ch. tram-line.
12/3/41	,, ..	S.F. 10	20	Unknown	14 17 0	..
22/3/41	Rotorua ..	,, 93	38·1	,, ...	..	Few trees scorched.
9/3/41	Canterbury ..	,, 85	0·1	,, ...	..	20 trees scorched.
12/2/41	Wellington ..	,, 94	1	,, ...	9 11 1	Cut over bush.
27/2/41	,, ..	,, 94	67	,, ...	163 3 3	Approximately 50,000 superficial feet rimu and white-pine scorched.
	Total number of fires	.. 32	3,758·3		513 9 3	

APPENDIX VII.

ANIMALS KILLED IN STATE FORESTS DURING YEAR ENDED 31ST MARCH, 1941.

Conservancy.	Rabbits and Hares.		Deer.	Pigs.	Goats.	Opossums.	Rats and Ferrets.	Totals.	
	Number.	Cost.	Number.	Number.	Number.	Number.	Number.	Number.	Cost.
		£ s. d.							£ s. d.
Auckland	..	..	..	..	..	..	..	..	..
Rotorua	1,271	376 4 8	59	161	..	..	..	1,491	376 4 8
Wellington	51	..	25	10	..	54	..	140	..
Nelson	1,160	156 6 0	79	23	11	68	12	1,353	156 6 0
Westland	..	..	..	..	..	178	..	178	..
Canterbury	8,202	954 9 11	85	..	..	..	..	8,287	954 9 11
Southland	6,012	386 15 3	372	67	..	359	17	6,827	386 15 3
Totals	16,696	1,873 15 10	620	261	11	659	29	18,276	1,873 15 10

APPENDIX VIII.

Indigenous Forests: Timber Sales.

Conservancy.	Kauri.	Rimu.	Miro.	Kahikatea.	Matai.	Totara.	Beech.	Others.	Total Value.
	Ft. b.m	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	£
Auckland	158,000	7,020,000	802,000	3,513,000	3,928,000	1,338,000	..	11,600	26,024
Rotorua	..	11,428,000	304,000	46,000	180,000	74,000	..	39,000	20,142
Wellington	..	13,587,000	838,000	2,223,000	1,773,000	819,000	42,900	68,800	32,660
Nelson	..	3,758,000	..	751,000	32,000	..	12,900	..	5,003
Westland	..	24,361,000	87,000	2,698,000	..	321,000	..	..	23,265
Southland	..	9,558,000	388,000	21,000	..	42,000	3,901,200	..	13,455
Totals ..	158,000	69,712,000	2,419,000	9,252,000	5,913,000	2,594,000	3,957,000	119,400	120,549

Grand total, all species: 94,124,000 board feet.

APPENDIX IX.

Creosoted State Forest Produce.

——	Posts and Strainers.	Poles.	Other Creosoted Produce.	Totals.
	Number.	Number.	Cubic Feet.	Cubic Feet.
Produce creosoted	81,029	4,576	14,361	102,211
Sales	50,294	1,815	1,456	48,574
Creosoted produce used by Forest Service	8,745	1,508	6,765	20,678
Creosoted stocks at 31st March, 1941	55,665	1,742	6,617	63,527
Untreated stocks at 31st March, 1941	98,810	6,040	6,438	126,420
	Gallons.	Gallons.	Gallons.	Gallons.
Creosote used	95,742	22,185	35,361	153,287

APPENDIX X.

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, 1938-40. Value represents value in country of export, plus 10 per cent. expressed in terms of New Zealand currency.)

Item.	1938.		1939.		1940.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Hardwoods—	Ft. b.m.	£	Ft. b.m.	£	Ft. b.m.	£
Australian hardwoods ..	29,186,000	435,800	30,840,000	456,600	10,782,000	172,100
Oak	2,094,000	48,900	2,512,000	53,100	1,195,000	63,000
Total	31,280,000	484,700	33,352,000	509,700	11,977,000	235,100
Softwoods						
Douglas fir	7,048,000	53,400	5,237,000	41,800	1,820,000	23,800
Butter-boxes	947,000	17,400	..	..	..	..
Redwood	3,064,000	47,500	3,788,000	68,700	961,000	20,500
Total	11,059,000	118,300	9,025,000	110,500	2,781,000	44,300
Other	892,000	6,100	1,160,000	18,700	271,000	19,200
Grand total ..	43,231,000	609,100	43,537,000	638,900	15,029,000	298,600
Laths, palings, shingles, &c.	..	3,731	..	2,752	..	31
	Tons.		Tons.		Tons.	
Tanning-bark	595	5,811	922	10,555	765	7,314
Wood-pulp	7,478	85,178	6,220	50,647	7,090	142,729

APPENDIX XI.

EXPORTS OF SAWN TIMBER AND OTHER FOREST PRODUCE.

(From information supplied by the Comptroller of Customs. All figures refer to the years ended 31st December' 1938–40.)

Item.	1938.		1939.		1940.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Ft. b.m.	£	Ft. b.m.	£	Ft. b.m.	£
White-pine	2,021,000	25,800	3,137,000	40,500	732,000	8,000
Rimu	7,407,000	74,000	6,673,000	63,900	11,931,000	112,000
Beech	2,427,000	30,200	1,258,000	13,400	1,575,000	20,600
Matai	563,000	5,500	241,000	2,400	994,000	13,200
Kauri	661,000	20,500	303,000	11,300	174,000	6,900
Insignis pine	1,263,000	19,300	1,222,000	18,700	1,889,000	33,100
Other New Zealand ..	188,000	2,100	86,000	900	29,000	600
Foreign	60,000	700	167,000	1,100	84,000	1,000
Total	14,590,000	168,100	13,087,000	152,200	17,408,000	195,400
	Tons.		Tons.		Tons.	
Kauri-gum	2,034	103,777	2,385	111,901	1,683	87,450
Tanning-bark	2	27	1	15	..	..
Fungus	38	3,980	28	3,724	433	2,377

APPENDIX XII.

PAYMENTS AND RECEIPTS FOR THE YEAR ENDED 31ST MARCH, 1941.

Item.	1940–41.	1939–40.	1938–39.	1937–38.
Payments.				
Allocation of revenue—	£	£	£	£
Consolidated Fund (portion of revenue from national-endowment forests)	16,151	14,416	18,712	16,458
Local bodies	16,593	15,612	12,566	16,329
General management charges—				
Salaries	77,831	70,858	63,422	57,185
General expenses	31,070	27,168	28,067	24,500
Land purchase	6,788	1,884	8,901	1,110
Forestry projects under direct management—				
Exotic	234,704	293,884	214,721	177,141
Indigenous	32,724	29,578	22,629	..
Utilization: Sawmill, creosote plant, &c. ..	148,545	120,344	52,777	4,875
Miscellaneous: Expenses of raising loans and interest on temporary advances	911	..	278	265
Totals	565,320	573,744	422,073	297,859
Receipts.				
Indigenous forests receipts—				
Timber sales	120,753	102,957	114,609	119,264
Timber royalties and trespass	8,539	12,130	11,292	9,996
Leases, grazing	1,558	1,618	1,498	1,545
Sawmill-sites, industrial, &c.	402	401	390	437
Miscellaneous	6,937	10,414	7,362	5,472
Log sales from managed forests	26,153	21,662	6,584	..
Exotic forests: Poles, posts, firewood, &c. ..	13,207	10,518	11,225	8,554
Utilization projects—				
Sawn timber	28,948	342	..	..
Creosoted products	7,996	314	46	..
Miscellaneous	2,470	282	731	..
Totals	216,963	160,638	153,737	145,268
Receipts from national-endowment indigenous forests (included in above)	27,408	22,114	20,085	24,756

APPENDIX XIII.

STATISTICS OF SAWMILLING AND SASH AND DOOR MANUFACTURING.

(Reprinted by arrangement with the Government Statistician from the Statistical Report on Factory and Building Production for the year 1939-40.)

Sawmilling and Sash and Door Manufacturing.

Provincial District.	Character of Organization.						Persons engaged in connection with Felling, Hauling, &c.						Persons engaged in connection with Production of Sawn Timber from Logs.							
	Number of Mills or Establishments.	Individual.	Partnership.	Registered Company. Public.	Registered Company. Private.	Co-operative and Miscellaneous.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, Salesmen, &c.	Wage-earners.	Contract.	Total.	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, Salesmen, &c.		Wage-earners.	Contract.	Total.	
							M.	M.	M.	M.	M.	M.	M.	M.	M.	F.	M.	M.	M.	F.
Auckland	151	34	32	24	61	..	19	19	4	629	206	877	45	69	70	15	1,202	80	1,466	15
Hawke's Bay	26	4	4	2	16	..	1	4	..	59	19	83	6	10	6	..	134	3	159	..
Taranaki	24	4	1	6	11	2	2	3	..	167	33	205	4	15	12	..	192	23	246	..
Wellington	61	12	6	3	39	1	3	12	..	299	15	329	9	27	15	2	394	16	461	2
Marlborough	7	3	4	..	..	..	1	..	..	19	4	24	3	1	..	..	19	..	23	..
Nelson	44	6	11	1	26	..	9	4	2	151	9	175	10	19	2	2	188	6	225	2
Westland	47	2	7	1	37	..	4	15	1	486	50	556	6	23	21	3	534	5	589	3
Canterbury	35	8	8	3	16	..	3	1	..	35	8	47	9	6	2	..	89	..	106	..
Otago—																				
Otago portion	23	4	5	3	11	..	6	4	..	67	1	78	9	7	1	..	82	..	99	..
Southland portion	43	6	7	2	28	..	7	8	3	262	4	284	6	19	12	3	291	3	331	3
Totals, 1939-40	461	83	85	45	245	3	55	70	10	2,174	349	2,658	107	196	141	25	3,125	136	3,705	25
,, 1938-39	444	87	85	43	226	3	55	74	9	2,026	252	2,416	105	178	133	31	3,097	59	3,572	31
,, 1937-38	474	103	95	49	224	3	66	62	11	2,275	249	2,663	133	169	131	23	3,191	139	3,763	23

Provincial District.	Persons engaged in connection with Resawing, Dressing, &c.								Persons engaged in connection with Total.								Salaries and Wages paid to Persons engaged in connection with Felling, Hauling, &c.	Salaries and Wages paid to Persons engaged in connection with Production of Sawn Timber from Logs.		Salaries and Wages paid to Persons engaged in connection with Resawing, Dressing, &c.		Salaries and Wages paid to Persons engaged in connection with Total.	
	Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, Salesmen, &c.		Wage-earners.	Contract.	Total.		Proprietors actively engaged.	Managers, Overseers, &c.	Accountants, Clerks, Salesmen, &c.		Wage-earners.	Contract.	Total.								
	M.	M.	M.	F.	M.	M.	M.	F.	M.	M.	M.	F.	M.	M.	M.	F.	£	£	£	£	£	£	£
Auckland	9	41	45	15	707	..	802	15	73	129	119	30	2,538	286	3,145	30	233,823	390,023	2,303	201,417	2,034	825,263	4,337
Hawke's Bay	4	4	6	..	56	..	70	..	11	18	12	..	249	22	312	..	20,963	38,833	..	17,767	20	77,563	20
Taranaki	1	9	7	5	181	6	204	5	7	27	19	5	540	62	655	5	55,264	64,307	..	51,047	584	170,618	584
Wellington	3	19	24	7	338	1	385	7	15	58	39	9	1,031	32	1,175	9	85,753	118,923	423	92,215	833	296,891	1,256
Marlborough	2	..	..	..	..	..	2	..	6	1	..	..	38	4	49	..	5,537	6,716	..	250	..	12,503	..
Nelson	3	6	3	8	56	..	68	8	22	29	7	10	395	15	468	10	43,407	55,487	154	16,876	973	115,770	1,127
Westland	..	1	..	..	16	..	17	..	10	39	22	3	1,036	55	1,162	3	154,782	158,515	480	3,966	..	317,263	480
Canterbury	7	18	21	10	235	..	281	10	19	25	23	10	359	8	434	10	11,995	25,187	..	70,113	1,415	107,295	1,415
Otago—																							
Otago portion	1	7	12	4	123	..	143	4	16	18	13	4	272	1	320	4	19,050	24,467	..	35,194	579	78,711	579
Southland portion	2	6	3	2	65	..	76	2	15	33	18	5	618	7	691	5	68,843	76,396	417	17,047	341	162,286	758
Totals, 1939-40	32	111	121	51	1,777	7	2,048	51	194	377	272	76	7,076	492	8,411	76	699,417	958,854	3,777	505,892	6,779	2,164,163	10,556
,, 1938-39	28	116	126	50	1,567	11	1,848	50	188	368	268	81	6,690	322	7,836	81	614,823	892,606	4,043	431,124	6,253	1,938,553	10,296
,, 1937-38	28	104	130	44	1,579	30	1,871	44	227	335	272	67	7,045	418	8,297	67	631,853	885,459	2,612	411,688	5,289	1,929,000	7,901

Sawmilling and Sash and Door Manufacturing—*continued*.

Provincial District.	Expenses of Operation, other than Salaries and Wages and Cost of Materials. Production of Logs at Mill. Rent.	Stumpage.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Production of Sawn Timber from Logs. Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Resawing, Dressing, and Manufacturing from Sawn Timber. Rent.	Cost of Power.	Fire and Accident Insurance (Premiums).	Depreciation.	Repairs.	Other Expenses.	Total.	Cost of Materials used or operated upon. Logs purchased.	Rough-sawn Timber purchased and other Materials.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Auckland ..	443	113,930	13,906	9,726	28,759	41,397	36,219	244,380	3,532	8,368	20,954	25,105	45,085	56,965	160,009	6,450	6,487	9,862	10,447	10,445	28,114	71,805	149,349	808,880	958,229
Hawke's Bay ..	35	14,496	729	1,209	859	2,759	5,188	25,275	82	858	1,974	2,226	4,229	4,810	14,179	250	939	887	862	1,376	2,739	7,053	9,684	59,745	69,429
Taranaki ..	..	27,196	578	2,975	4,741	10,689	1,465	47,644	1,218	544	3,284	3,162	7,371	3,688	19,267	269	981	2,160	1,587	2,609	2,674	10,280	31,986	72,713	104,699
Wellington ..	190	41,373	3,038	3,817	8,170	16,884	6,291	79,763	478	1,971	6,370	5,769	15,844	15,286	45,718	5,197	2,464	4,827	3,923	6,627	8,061	31,099	21,809	272,180	293,989
Marlborough ..	..	2,438	443	201	138	556	310	4,086	18	567	338	243	593	522	2,281	..	34	10	20	34	..	98	..	264	264
Nelson	88	18,279	4,383	1,933	4,630	6,469	8,536	44,318	302	1,754	2,725	5,681	6,009	4,855	21,326	749	1,550	654	723	689	2,390	6,755	1,480	46,936	48,416
Westland ..	1,078	54,736	8,155	5,918	10,699	19,510	19,566	119,662	2,105	4,758	8,053	7,916	17,812	29,531	70,175	30	258	112	354	1,056	631	2,441	..	9,277	9,277
Canterbury ..	..	5,292	1,672	356	310	624	1,273	9,527	190	2,514	1,401	1,291	2,544	4,330	12,270	1,388	3,866	3,954	3,437	4,658	5,224	22,527	24,542	209,511	234,053
Otago—																									
Otago portion ..	..	6,268	464	1,067	841	3,980	1,543	14,163	256	265	1,244	810	3,424	3,360	9,359	1,845	1,377	1,554	1,556	2,822	4,170	13,324	996	73,753	74,749
Southland portion	1,234	17,968	2,727	3,288	3,942	8,499	5,758	43,416	670	1,383	3,774	3,426	7,375	7,588	24,216	270	986	1,110	1,426	2,595	1,822	8,209	4,842	65,708	70,550
Totals, 1939–40	3,068	301,976	36,095	30,490	63,089	111,367	86,149	632,234	8,851	22,982	50,117	55,629	110,286	130,935	378,800	16,448	18,942	25,130	24,335	32,911	55,825	173,591	244,688	1,618,967	1,863,655
,, 1938–39	2,820	290,722	28,343	28,328	66,204	99,859	80,358	596,634	9,466	19,870	45,316	47,863	99,195	120,438	342,148	10,174	17,359	23,787	21,652	30,903	64,189	168,064	271,286	1,429,701	1,700,987
,, 1937–38	3,573	287,385	49,219	28,719	59,021	108,436	106,869	643,222	9,994	19,273	43,814	48,030	92,398	170,798	384,307	10,831	17,264	23,298	21,462	33,588	74,806	181,249	329,979	1,240,620	1,570,599

Provincial District.	Total Costs of Operation (including Salaries and Wages). Felling, Hauling, and Delivering Logs at Mill.	Production of Sawn Timber from Logs.	Resawing, Dressing, and Manufacturing from Sawn Timber.	Total.	Products. Log Sawmill Products. Rough-sawn Timber. Quantity.	Rough-sawn Timber. Value.	Laths, Posts, Waste Products, &c.	Total.	Resawing and Planing-mill Products. Planed Flooring, Skirting, Moulding, &c. Quantity.	Planed Flooring, Skirting, Moulding, &c. Value.	Sashes and Doors.	Joinery.	Butter-boxes.	Cheese-crates.	Fruit-cases.	Other Products.	Total.	Total Value of all Products.
	£	£	£	£	Ft. b.m.	£	£	£	Ft. b.m.	£	£	£	£	£	£	£	£	£
Auckland	478,203	701,684	1,084,136	2,264,023	117,544,544	1,256,110	9,754	1,265,864	35,366,790	639,457	123,135	184,487	165,448	14,280	34,142	41,341	1,202,290	2,468,154
Hawke's Bay	46,238	62,696	34,585	193,519	14,974,249	133,506	989	134,495	2,844,475	43,288	4,002	2,461	16	3,334	26,243	3,549	82,893	217,388
Taranaki	102,908	115,560	134,624	353,092	25,678,125	251,682	558	252,240	4,705,463	74,267	15,378	25,515	64	9,011	..	3,446	127,681	379,921
Wellington	165,516	186,873	396,327	748,716	36,110,150	378,225	7,164	385,389	11,929,390	249,472	50,951	63,857	10,225	15,811	258	47,652	438,226	823,615
Marlborough	9,623	8,997	612	19,232	2,249,794	20,391	656	21,047	17,000	382	241	76	..	..	..	20	719	21,766
Nelson	87,725	78,447	71,540	237,712	22,101,738	184,911	1,935	186,846	789,993	15,374	1,851	1,836	2,508	1,101	39,231	6,159	68,060	254,906
Westland	274,444	229,170	15,684	519,298	68,807,782	562,662	1,199	563,861	1,273,529	15,265	..	..	2,988	..	..	..	18,253	582,114
Canterbury	21,522	61,999	303,566	387,087	11,666,378	92,695	1,163	93,858	7,184,578	156,322	17,197	56,677	3,303	1,850	26,132	82,397	343,878	437,736
Otago—																		
Otago portion ..	33,213	34,822	122,850	190,885	8,735,952	74,484	582	75,066	2,848,320	70,462	18,084	32,011	..	2,102	600	16,794	140,053	215,119
Southland portion ..	112,259	105,871	91,305	309,435	28,122,570	243,886	159	244,045	1,902,954	29,055	..	..	1,936	14,293	12,132	28,414	85,830	329,875
Totals, 1939–40 ..	1,331,651	1,586,119	2,305,229	5,222,999	335,991,282	3,198,552	24,159	3,222,711	68,862,492	1,293,344	230,839	366,920	186,488*	61,782*	138,738*	229,772	2,507,883	5,730,594
,, 1938–39 ..	1,211,457	1,510,083	2,035,142	4,756,682	316,715,882	2,935,105	32,317	2,967,422	69,636,088	1,210,492	133,451	210,801	172,552	52,329	131,355	196,301	2,107,281	5,074,703
,, 1937–38 ..	1,275,075	1,602,357	1,838,846	4,716,278	322,765,786	3,028,656	12,793	3,041,449	64,422,316	1,144,621	118,112	194,646	198,813	47,193	134,285	182,014	2,019,684	5,061,133

* Butter-boxes made numbered 2,151,599; cheese-crates, 557,636; fruit-cases, 3,991,152.

Sawmilling and Sash and Door Manufacturing—*continued.*

Provincial District.	Motive Power used for Hauling and Delivering. Kind of Engine. Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Motive Power used for Production of Sawn Timber from Logs. Kind of Engine. Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Motive Power used for Resawing, Dressing, and Manufacturing from Sawn Timber. Kind of Engine. Steam.	Gas.	Petrol and Light Oil.	Oil (Heavy).	Electric.	Water.	Total.	Total Horse-power available.	Approximate Value. Sawmill. Land and Buildings.	Tramways and Tram Plant.	Logging and Hauling Equipment.	Other Machinery	Total	Planing and Resawing Mill. Land and Buildings.	Tramways.	Other Machinery	Total.	Total Value.
																									£	£	£	£	£	£	£	£	£	£
Auckland ..	91	..	43	32	6	..	172	5,323	104	..	19	21	78	1	223	6,932	19	..	4	4	462	..	489	6,336	128,931	160,176	143,514	188,883	621,504	117,910	8,674	99,513	226,097	847,601
Hawke's Bay	14	..	5	4	..	..	23	444	11	..	..	1	22	..	34	1,020	4	..	1	..	49	..	54	543	7,214	2,470	5,958	18,613	34,255	20,377	807	9,677	30,861	65,116
Taranaki ..	21	..	3	7	..	..	31	871	19	..	..	1	8	..	28	734	1	..	..	..	48	..	49	517	30,358	42,497	15,899	25,985	114,739	13,890	..	10,336	24,226	138,965
Wellington ..	43	..	13	15	..	..	71	1,544	33	..	5	3	16	..	57	1,364	9	..	..	..	170	..	179	2,104	62,408	37,911	44,872	75,289	220,480	99,711	..	37,104	136,815	357,295
Marlborough	4	..	3	..	..	..	7	123	4	..	2	2	..	..	8	169	..	..	..	..	2	..	2	27	986	500	3,270	1,910	6,666	1,000	..	400	1,400	8,066
Nelson ..	20	..	15	10	1	..	46	1,118	26	..	5	6	3	2	42	1,320	7	..	6	2	39	1	55	610	19,331	22,682	17,064	34,512	93,589	12,476	..	8,987	21,463	115,052
Westland ..	85	..	25	10	7	..	127	3,055	38	..	3	5	55	..	101	2,791	4	..	..	..	7	..	11	197	57,252	101,448	59,162	70,339	288,201	1,546	..	4,047	5,593	293,794
Canterbury	1	..	5	1	..	..	7	162	5	..	1	1	44	..	51	954	3	..	..	..	242	..	245	1,980	11,691	150	1,958	20,085	33,884	49,402	3,926	23,413	76,741	110,625
Otago—																																		
Otago portion	13	1	7	1	..	..	22	336	13	2	1	..	..	..	16	361	..	..	..	..	41	8	49	696	6,629	5,638	5,061	17,211	34,539	28,686	..	14,864	43,550	78,089
Southland portion	45	2	15	5	..	..	67	994	40	..	3	..	12	..	55	1,039	3	..	..	..	35	..	38	365	29,148	31,093	12,363	43,880	116,484	7,020	81	17,658	24,759	141,243
Totals—																																		
1939–40	337	3	134	85	14	..	573	13,970	293	2	39	40	238	3	615	16,684	50	..	11	6	1095	9	1171	13,375	353,948	404,565	309,121	496,707	1,564,341	352,018	13,488	225,999	591,505	2,155,846
1938–39	345	4	146	65	20	..	580	13,378	306	3	61	24	190	4	588	15,101	53	1	10	29	916	2	1011	12,521	345,262	429,428	250,685	499,345	1,524,720	306,224	3,020	227,171	536,415	2,061,135
1937–38	382	1	..	217	18	..	618	13,134	321	1	..	73	199	3	597	14,753	53	2	..	8	901	1	965	11,740	337,371	453,053	262,377	497,998	1,550,799	294,436	1,003	210,850	506,289	2,057,088

Provincial District.	Number of Log-sawmills.	Approximate Sawn Output of various Kinds of Timber at Log-sawmills during the Year 1939–40. Kauri.	Rimu.	Kahikatea.	Matai.	Totara.	Beech.	Tawa.	Miro.	Pinus Insignis.	Other and Unspecified.	Total.	Average Mill Output.	Maximum Daily Capacity of Mills (8 Hours).	Area Cut.
		Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Ft. b.m.	Acres.
Auckland	112	5,065,511	70,710,333	10,820,683	8,553,287	6,340,052	12,979	422,218	259,752	14,510,151	849,578	117,544,544	1,049,505	666,400	9,842
Hawke's Bay	19	..	7,821,938	2,075,458	1,319,003	374,972	4,326	..	..	3,282,584	95,968	14,974,249	788,118	84,825	286
Taranaki	20	..	13,639,895	3,449,118	4,472,939	1,108,787	12,961	6,185	101,000	2,879,222	8,018	25,678,125	1,283,906	116,200	2,284
Wellington	43	..	19,720,773	2,975,398	5,745,025	2,847,278	378,330	30,836	631,509	3,695,129	85,872	36,110,150	839,771	234,500	2,549
Marlborough	6	..	1,262,781	38,853	55,264	11,382	74 388	..	900	604,500	201,726	2,249,794	374,966	14,397	328
Nelson	38	..	14,686,194	1,817,185	271,798	6,089	858,693	..	..	4,428,052	33,727	22,101,738	581,625	167,500	1,857
Westland	46	..	57,704,672	10,286,178	555,113	83,875	161,825	..	2,600	..	13,519	68,807,782	1,495,821	361,500	5,217
Canterbury	21	..	..	..	..	..	..	..	..	11,610,237	56,141	11,666,378	555,542	62,200	126
Otago—															
Otago portion ..	16	..	6,221,567	3,301	25,834	..	1,004,919	..	13,613	1,449,405	17,313	8,735,952	545,997	62,600	799
Southland portion ..	42	..	15,328,994	1,576,534	213,773	109,366	6,499,565	..	74,827	4,303,130	16,381	28,122,570	669,585	161,650	2,334
Totals, 1939–40 ..	363	5,065,511	207,097,147	33,042,708	21,212,036	10,881,801	9,007,986	459,239	1,084,201	46,762,410	1,378,243*	335,991,282	925,596	1,931,772	25,622
,, 1938–39 ..	360	6,203,329	188,536,482	33,432,487	22,776,208	11,237,379	9,036,299	116,534	2,473,464	41,867,513	1,036,187	316,715,882	879,766	1,903,102	25,478
,, 1937–38 ..	394	8,296,998	187,866,163	43,662,352	21,254,997	12,793,702	8,824,758	453,898	1,495,398	36,359,183	1,758,337	322,765,786	819,203	1,996,466	..

* Details for 1939–40 include Douglas fir, 390,923 ft. b.m.; blue gum, 349,087 ft. b.m.; tanekaha, 110,210 ft. b.m.; rata, 103,496 ft. b.m.; poplar, 81,902 ft. b.m.; macrocarpa, 65,988 ft. b.m.; mangaeo, 57,214 ft. b.m.; taraire, 44,278 ft. b.m.; puriri, 37,481 ft. b.m.; rewarewa, 22,396 ft. b.m.; maire, 18,067 ft. b.m.; kamahi, 16,381 ft. b.m.; stringy bark, 11,667 ft. b.m.; pukatea, 8,342 ft. b.m.; silver pine, 7,613 ft. b.m.; kaikawaka, 5,906 ft. b.m.; other and unspecified, 41,292 ft. b.m.

GLOSSARY.

1. Indigenous.

(*a*) *Softwoods :—*
Kaikawaka (*Libocedrus bidwillii*).
Kauri (*Agathis australis*).
Matai (*Podocarpus spicatus*).
Miro (*Podocarpus ferrugineus*).
Rimu (*Dacrydium cupressinum*).
Silver-pine (*Dacrydium colensoi*).
Tanekaha (*Phyllocladus trichomanoides*).
Totara (*Podocarpus totara*).
White-pine (*Podocarpus dacrydioides*).

(*b*) *Hardwoods :—*
Hard beech (*Nothofagus truncata*).
Hinau (*Elaeocarpus dentatus*).
Kamahi (*Weinmannia racemosa*).
Kowhai (*Edwardsia microphylla*).
Maire (*Olea cunninghamii*).
Mangeao (*Litsaea calicaris*).
Manuka (*Leptospermum* spp.).
Rata (*Metrosideros* spp.).
Red beech (*Nothofagus fusca*).
Silver beech (*Nothofagus menziesii*).
Taraire (*Beilschmiedia taraire*).
Tawa (*Beilschmiedia tawa*).

2. Exotic.

(*a*) *Softwoods :—*
Bishop's pine (*Pinus muricata*).
Corsican pine (*Pinus laricio*).
Douglas fir (*Pseudotsuga taxifolia*).
Fijian kauri (*Agathis vitiensis*).
Hemlock (*Tsuga* spp.).
Insignis pine (*Pinus radiata*).
Japanese cypress (*Cryptomeria japonica*).
Larch (*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*).
Spruce (*Picea* spp.).
Western yellow-pine (*Pinus ponderosa*).
Western red cedar (*Thuya plicata*).
White-pine (American) (*Pinus strobus*).

(*b*) *Hardwoods :—*
Australian hardwoods, principally *Eucalyptus* spp.
Lignum vitæ (*Guaiacum officinale*).
Oak (*Quercus* spp.).
Red alder (*Alnus rubra*).
Teak (*Tectona grandis*).
Wattle (*Acacia* spp.).

Approximate Cost of Paper.—Preparation, not given ; printing (1,145 copies), £70.

By Authority: E. V. Paul, Government Printer, Wellington.—1941.
Price 1s. 3d.]